Predecision

ENVIRONMENTAL ASSESSMENT (EA)

BIRD DAMAGE MANAGEMENT AT LIVESTOCK FEEDING FACILITIES IN THE KANSAS WILDLIFE SERVICES PROGRAM

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Predecision

TABLE OF CONTENTS

Predecision

1.0 CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

USDA/APHIS/ Wildlife Services (WS)[1] is authorized by Congress to manage a program to reduce human/wildlife conflicts. WS's mission is to "provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety." This is accomplished through:

A) training of wildlife damage management professionals;
B) development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
C) collection, evaluation, and dissemination of management information;
D) cooperative wildlife damage management programs;
E) informing and educating the public on how to reduce wildlife damage and;
F) providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1989).

This Environmental Assessment (EA) evaluates ways by which this responsibility can be carried out to resolve conflicts with bird species at livestock feeding facilities in Kansas.

WS is a cooperatively funded and service oriented program. Before any operational wildlife damage management is conducted, *Agreements for Control* or *WS Work Plans* must be completed by WS and the land owner/administrator. WS cooperates with private property owners and managers and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable federal, state, and local laws.

Individual actions of the type encompassed by this analysis are categorically excluded under the APHIS Implementing Regulations for compliance with the National Environmental Policy Act (NEPA) (7 CFR 372.5(c)). APHIS Implementing Regulations also provide that all technical assistance furnished by WS is categorically excluded (7 CFR 372.5(c)) (60 Federal Register 6,000, 6,003 (1995)). WS has decided to prepare this EA to assist in planning bird damage management (BDM) activities at livestock feeding facilities by the program in Kansas and to clearly communicate with the public the analysis of cumulative impacts for a number of issues of concern in relation to alternative means of meeting needs for such management in the State. This analysis covers WS's plans for current and future BDM actions wherever they might be requested at livestock feeding facilities within the State of Kansas.

1.2 Purpose

The purpose of this EA is to analyze the effects of WS activities in Kansas to manage damage at livestock feeding facilities caused by bird species or species groups that include the following: European starlings (*Sturnus vulgaris*), blackbirds (the blackbird group), feral domestic pigeons (*Columbia livia*), and house or English sparrows (*Passer domesticus*). Resources protected by such activities include livestock feed, livestock health, and property. Hereinafter, blackbirds refers to the blackbird group as described in the Final Environmental Impact Statement (FEIS) prepared by the WS program (USDA 1994). The blackbird group comprises the Subfamily Icterinae, including red-winged (*Agelaius phoeniceus*), tricolored (*A. tricolor*), rusty (*Euphagus carolinus*), brewer's (*E. cyanocephalus*), and yellow-headed blackbirds (*Xanthocephalus xanthocephalus*); brown-headed cowbird (*Molothrus ater*) and bronzed cowbird (*Tangavius aeneus*); and great-tailed grackle (*Cassidix mexicanus*), and

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[1]As of August 1, 1997, the name of the USDA, APHIS Animal Damage Control (ADC) Program was changed to Wildlife Services (WS). All references to ADC are considered synonymous to WS.

common grackle (*Quiscalus quiscula*). The tri-colored blackbird within this group is not known to occur in Kansas and would not be included among the species causing damage addressed by this EA.

1.3 Need for Action

1.3.1 Summary of Proposed Action (Identified Throughout this Document as Alternative 3)

WS's proposed action is to provide assistance to Kansas livestock feeding facilities in resolving bird damage problems. The program would respond to requests to reduce or minimize the loss of livestock feed, damage to facility property, and the risk of bird-related livestock health problems presented primarily by starlings and blackbirds, and, to a lesser degree, by feral pigeons and house sparrows at requesting dairies and livestock feedlots. The program expects to receive requests from no more than 6 livestock feeding facilities in the State in any one year. An Integrated Wildlife Damage Management (IWDM) approach would be implemented which would allow use of any legal technique or method, used singly or in combination, to meet requestor needs for resolving conflicts with birds at such facilities. Facility managers requesting assistance would be provided with information regarding the use of effective nonlethal and lethal techniques. Nonlethal methods used by WS could include scaring with pyrotechnics, broadcast distress calls, propane exploders. Lethal methods used by WS would include DRC-1339, shooting, or euthanasia following live capture by trapping. Most of the birds killed by use of DRC-1339 would not be retrieved but would be allowed to decompose and/or be consumed by scavengers. WS would plan to retrieve visible dead birds in areas where they might be objectionable to members of the public. In many situations, the implementation of nonlethal methods such as exclusion-type barriers would be the responsibility of the requestor to implement. Operational BDM at livestock feeding facilities by WS would be allowed in the State, when requested where a need has been determined and upon completion of an *Agreement for Control*. All management actions would comply with appropriate federal, state, and local laws.

1.3.2 Need for Bird Damage Management at Livestock Feeding Facilities

Blackbirds, starlings, English (or house) sparrows, and, to a lesser extent, feral domestic pigeons often cause damage at cattle and hog feeding facilities and dairies by congregating in large numbers to feed on the grain component of livestock feed. The birds also cause damage by defecating on fences, shade canopy structures, and other structures, which can accelerate corrosion of metal components and which generally is considered an unsightly nuisance. Additionally, these birds and their droppings are a source of several diseases that can infect feedlot operators, their personnel, and livestock. Custom feedlot operators suffer additional damage in the form of lost business because some customers tend to avoid facilities that have excessive numbers of birds present during a significant portion of the year.

<u>Contribution of Livestock and Dairies to the Economy</u>. Livestock and dairy production in Kansas contributes substantially to local economies. In July 2000, Kansas feedlots with a capacity of more than 1000 head maintained 2.16 million cattle on feed. In 1998 the inventory value of all cattle and calves was reported to be more than $3.6 billion. The State had 90,000 milk cows on July 1, 2000. In 1998 there were more than 1.3 billion lbs. of milk produced generating $190,071 million in producer gross income during 1998 (KASS 1998). Kansas ranks third in the U.S. in cattle numbers on feed. Kansas ranks first in the U.S. in number of cattle slaughtered.

<u>Scope of Livestock Feed Losses</u>. The problem of starling damage to livestock feed has been documented in France and Great Britain (Feare 1984), and in the United States (Besser et. al. 1968). The concentration of larger numbers of cattle eating huge quantities of feed in confined pens results in a tremendous attraction to starlings, blackbirds, and feral domestic pigeons. Diet rations for cattle contain all of the nutrients and fiber that cattle need and are so thoroughly mixed that cattle are unable to select any one component over others. The basic constituent of most rations at cattle-feeding facilities in Kansas is cereal grains which may be

incorporated as whole grains, crushed or ground cereal. While cattle cannot select individual ingredients from that ration, starlings can and do sometimes select the higher energy grain components, thereby altering the energetic value of the complete diet. The removal of this high energy fraction by starlings is believed to reduce milk yields of dairy cows and weight gains in feeder cattle and can be economically significant (Feare 1984). Glahn and Otis (1986) reported that starling damage was also associated with proximity to roosting sites, snow, and freezing temperatures and the number of livestock on feed.

Besser et al. (1968) calculated starlings and redwing blackbirds cost feedlot operators $84 and $2, respectively, per 1000 birds based on observations of feeding habits of banded and color-marked birds at 12 feedlots in Colorado. The differences between the two species were because starlings consumed a greater quantity of feed per bird and selected more expensive components of the feed rations than did redwings. Forbes (1995) reported starlings consume up to 50% of their body weight in feed each day. Glahn and Otis (1981) reported losses of 4.8 kg of pelletized feed consumed per 1,000 bird minutes. Glahn (1983) reported that 25.8% of farms in Tennessee experienced starling depredation problems of which 6.3% experienced significant economic loss. Williams (1983) estimated seasonal feed losses to five species of blackbirds (primarily brown-headed cowbirds) at one feedlot in south Texas at nearly 140 tons valued at $18,000 in 1980-81.

The Besser et al. study reported that (1) starlings and redwings obtained 50% and 10%, respectively, of the feed they consumed from feed troughs (the rest of the birds' feed consumption is assumed to have been spilled grain which would otherwise not be used by livestock anyway), (2) starlings and redwings spent 50% and 30%, respectively, of the days during winter at the feedlots, and (3) consumption capacities per bird per day were 28.3 g (0.0625 lb.) for starlings and 11.1 g (0.0245 lb.) for redwings. Feed costs for operators in Kansas currently are about $110 per ton for complete rations. The grain component (flaked corn), which is the component assumed to be taken by blackbirds and starlings, currently costs about $82 per ton. Based on this information, the estimated value of livestock feed consumed by 3 million starlings and 1 million redwings (the numbers of each species expected to be removed by WS BDM operations) over a 120 day wintering period would be more than $230,000. Actual value of feed losses may be double this amount because the estimates of 3 million and 1 million starlings and redwings to be removed are based on observations of birds feeding at cattle feedlots. Thus, the true value of feed losses by that many birds is probably more than $460,000 per year.

A large cattle feeding operation in the panhandle of Texas had upwards of 1,000,000 blackbirds and starlings using the facility per day (estimated by experienced WS field personnel; R. Gilliland, WS, pers. comm. 2000). The operators had a similar facility that did not have bird damage problems. They reported that, based on a comparison between facilities with regard to feed losses, livestock health problems (primarily coccidiosis), and water trough maintenance costs (continuous labor costs for cleaning bird droppings out of water troughs), bird damage was costing them about $5,000/day (R. Gilliland, WS, pers. comm. 2000).

An analysis of blackbird and starling depredation at 10 cattle feeding facilities in Arizona that used WS BDM services conservatively estimated that the value of feed losses on the 10 facilities would have been about $120,000 without WS BDM services. In comparison, the cost of service was approximately $40,000/yr and was paid by the facility managers (USDA 1996). A similar analysis has not been performed for Kansas feedlots. However, blackbird and starling numbers that have been observed by WS personnel at Kansas feedlots have generally been many times greater than the numbers observed at the Arizona facilities (USDA 1996). Therefore, the value of feed losses at the Kansas feedlots is probably much greater per facility than calculated in the Arizona analysis.

The value of losses to bird damage reported by Kansas feedlot operators to WS totaled $600,000 in FY 1999. That total is based on reports from only three operators. Economic losses caused by birds were a result of feed consumption, feed contamination, accelerated corrosion of fencing, corrals, and other infrastructure materials due to fecal matter, threat of diseases, and loss of business for custom feeder operations due to customer perceptions or beliefs about the effect on weight gain and disease problems caused by the presence of large numbers of birds. One feedlot manager stated that revenues lost by a depleted customer base may be more severe than losses associated with feed consumption.

The Kansas WS program has responded to past requests for services by providing technical assistance. Technical assistance consists of telephone or site visits to the operator's location. A variety of control techniques is discussed and, in some situations, demonstrated. In several cases the correct use of legally registered toxicants has been demonstrated by WS and/or Cooperative Extension Service (CES) personnel. WS provided technical BDM assistance to three such facilities during FY 99 which included the use of DRC-1339 in technical assistance demonstration projects. Should the decision be made to implement an alternative that includes operational BDM, requests for BDM could increase in the future as facility managers become aware of the WS program.

Scope of Livestock Health Problems. A number of diseases that affect livestock have been associated with feral domestic pigeons, starlings, blackbirds, and English sparrows (Weber 1979). Although yet to be proven scientifically, transmission of diseases such as transmissible gastroenteritis virus (TGE), tuberculosis (TB), and coccidiosis to livestock have been suspected as being linked to migratory flocks of starlings and blackbirds. Estimates of the dollar value of this type of damage are not available. A consulting veterinarian for a large cattle feeding facility in Texas indicated problems associated with coccidiosis declined following reduction of starling and blackbird numbers using the facility (R. Gilliland, WS, Canyon District, TX, pers. comm. 2000). Starlings were implicated in a TGE outbreak that killed more than 10,000 pigs in one county in southeast Nebraska in the winter of 1978-79 (Johnson and Glahn 1994). Table 1-1 summarizes some of these diseases and the problems they can cause.

Table 1-1. Some diseases of livestock that have been linked to feral domestic pigeons, starlings, blackbirds, and/or English sparrows. Information from Weber (1979).

Disease	Livestock affected	Symptoms	Comments
Bacterial:			
erysipeloid	cattle, swine, horses, sheep, goats, chickens, turkeys, ducks	pigs - arthritis, skin lesions, necrosis, septicemia Sheep - lameness	serious hazard for the swine industry, rejection of swine meat at slaughter due to septicemia, also affects dogs
salmonellosis	all domestic animals	abortions in mature cattle, mortality in calves, decrease in milk production in dairy cattle; Colitis in pigs,	over 1,700 serotypes

Pasteurellosis	cattle, swine, horses, rabbits, chickens, turkeys	chickens and turkeys die suddenly without illness; pneumonia, bovine mastitis, abortions in swine, septicemia, abscesses	also affects cats and dogs
avian tuberculosis	chickens, turkeys, swine, cattle, horses, sheep	emaciation, decrease in egg production, and death in poultry; Mastitis in cattle	also affects dogs and cats
streptococcosis	cattle, swine, sheep, horses, chickens, turkeys, geese, ducks, rabbits	emaciation and death in poultry; mastitis in cattle, abscesses and inflamation of the heart, and death in swine	feral pigeons are susceptible and aid in transmission
yersinosis	cattle, sheep, goats, horses, turkeys, chickens, ducks	abortion in sheep and cattle	also affects dogs and cats
vibriosis	cattle and sheep	in cattle, often a cause of infertility or early embryonic death; in sheep, the only known cause of infectious abortion in late pregnancy	of great economic importance
Listeriosis	Chickens, ducks, geese, cattle, horses, swine, sheep, goats	In cattle, sheep, and goats, difficulty swallowing, nasal discharge, paralysis of throat and facial muscles	also affects cats and dogs
Viral:			
meningitis	cattle, sheep, swine, poultry	inflamation of the brain, newborn calve unable to suckle	associated with listeriosis, salmonellosis, cryptococcosis
encephalitis (7 forms)	horses, turkeys, ducks	drowsiness, inflamation of the brain	mosquitos serve as vectors
Mycotic (fungal):			
aspergillosis	cattle, chickens, turkeys, and ducks	abortions in cattle	common in turkey poults
blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	rarely	affects horses, dogs and cats

candidiasis	cattle, swine, sheep, horses, chickens, turkeys	in cattle, mastitis, diarrhea, vaginal discharge, and aborted fetuses	causes unsatisfactory growth in chickens
cryptococcosis	cattle, swine, horses	chronic mastitis in cattle, decreased milk flow and appetite loss	also affects dogs and cats
histoplasmosis	horses cattle and swine	chronic cough, loss of appetite, weakness, depression, diarrhea, extreme weight loss	also affects dogs; actively grows and multiplies in soil and remains active long after birds have departed
Protozoal:			
coccidiosis	poultry, cattle, and sheep	bloody diarrhea in chickens, dehydration, retardation of growth	almost always present in English sparrows; also found in pigeons and starlings
American trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks	caused by the conenose bug found on pigeons
toxoplasmosis	cattle, swine, horses, sheep, chickens, turkeys	in cattle, muscular tremors, coughing, sneezing, nasal discharge, frothing at the mouth, prostration and abortion	also affects dogs and cats
Rickettsial/ Chlamydial:			
chlamydiosis	cattle, horses, swine, sheep, goats, chickens, turkeys, ducks, geese	In cattle, abortion, arthritis, conjunctivitis, enteritis	also affects dags and cats and many wild birds and mammals
Q fever	affects cattle, sheep, goats, and poultry	may cause abortions in sheep and goats	can be transmitted by infected ticks

Although it remains to be proven that birds are definitely responsible for these types of disease outbreaks, the perception that they may be responsible could cause some customers to avoid placing livestock at certain facilities that have substantial bird problems.

1.4 Relationship of this Environmental Assessment to Other Environmental Documents

WS has issued a Final Environmental Impact Statement on the national APHIS/WS program (USDA 1994). This EA is tiered to the Final EIS. Pertinent information available in the FEIS has been incorporated by reference into this EA.

1.5 Decision to Be Made

Predecision

Based on the scope of this EA, the decisions to be made are:

- Should WS conduct BDM at livestock feeding facilities in the State?
- Might the proposed action have significant impacts on the quality of the human environment requiring preparation of an EIS?

1.6 Scope of this Environmental Assessment Analysis

1.6.1 Actions Analyzed. This EA evaluates bird damage management by WS to protect livestock feed, livestock health, and property at livestock feeding facilities in Kansas whenever and wherever such management is requested from the WS program. WS currently expects no more than 6 such requests per year.

1.6.2 Period for Which this EA is Valid. This EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of the BDM activities conducted.

1.6.3 Site Specificity. This EA analyzes potential impacts of WS's BDM activities that will occur or could occur at livestock feeding facilities within the State of Kansas. Because the program's goal and responsibility is to provide service when requested within the constraints of available funding and personnel, it is conceivable that BDM activity by WS could occur on any livestock feeding facility in the State. Thus, this EA analyzes the potential impacts of such efforts wherever and whenever they might occur as part of the current program. The EA emphasizes significant issues as they relate to specific areas whenever possible. However, the issues that pertain to the various types of bird damage and resulting management are similar, for the most part, wherever they occur, and are treated as such. The standard WS Decision Model (Slate et al. 1992; WS Directive 2.105) is the routine thought process that is used at the site-specific level for determining methods and strategies to use or recommend for individual actions conducted by WS in the State (See USDA 1994, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). Decisions made using this thought process will be in accordance with any mitigation measures and standard operating procedures described herein and adopted or established as part of the decision.

1.7 Authority and Compliance

1.7.1 Authority of Federal and State Agencies in Bird Damage Management in Kansas[2]

1.7.1.1 WS Legislative Authority

The primary statutory authority for the WS program is the Animal Damage Control Act of 1931 (7 U.S.C. 426-426c; 46 Stat. 1468), which provides that:

> *The Secretary of Agriculture is authorized and directed to conduct such investigations, experiments, and tests as he may deem necessary in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control on national forests and other areas of the public domain as well as on State, Territory or privately owned*

[2] See Chapter 1 of USDA (1994) for a complete discussion of federal laws pertaining to WS.

> *lands of mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jackrabbits, brown tree snakes and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, furbearing animals, and birds, and for the protection of stock and other domestic animals through the suppression of rabies and tularemia in predatory or other wild animals; and to conduct campaigns for the destruction or control of such animals. Provided that in carrying out the provisions of this Section, the Secretary of Agriculture may cooperate with States, individuals, and public and private agencies, organizations, and institutions."*

Since 1931, with the changes in societal values, WS policies and programs place greater emphasis on the part of the Act discussing "*bringing (damage) under control*," rather than "*eradication*" and "*suppression*" of wildlife populations. In 1988, Congress strengthened the legislative mandate of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

> *"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."*

1.7.1.2 Kansas Department of Wildlife and Parks (KDWP)

The KDWP is responsible under KSA. 32-701 through 32-1127 for managing wildlife species in the State. Wildlife species under KDWP authorities include game, nongame, and threatened and endangered species. The KDWP is the agency responsible for authorizing any use of chemical toxicants for controlling damaging bird species. A permit must be obtained from KDWP for any use of toxicant bird control materials at livestock feeding facilities in the State. KDWP works under the authority of the Kansas Wildlife and Parks Commission. Also, WS maintains a statewide scientific collecting permit issued by the KDWP which regulates take of migratory birds protected by state law.

1.7.1.3 Kansas State University Cooperative Extension Service (KSU-CES)

KSU-CES is directed by (KSA) 76-459 through 76-464 to develop a statewide program for control of damage caused by wildlife. The program focuses on instructing farmers and ranchers in effective methods of controlling damage caused by wildlife, which will enable farmers and ranchers to more effectively protect their crops, poultry, and livestock, on conducting studies on ways to prevent agricultural losses caused by wildlife including nonlethal methods of control, and to supply individuals, at cost, with materials not readily available from local commercial sources for use in damage control work.

1.7.1.4 Kansas Department of Agriculture (KDA)

KDA has regulatory authority for the safe and proper use of pesticides in wildlife damage management (KSA 2-2453 and 2-2454), certification of applicators (KSA 2-244la and 2-2445a), and product label registration (KSA 2-2201). Any use of pesticide products in BDM by WS in the State would be subject to KDA's regulatory requirements.

1.7.1.5 U.S. Fish and Wildlife Service (USFWS)

The USFWS is responsible for managing and regulating take of bird species that are listed as migratory under the Migratory Bird Treaty Act and those that are listed as threatened or endangered under the Endangered Species Act. Sections 1.7.2.2 and 1.7.2.3 below describe WS's interactions with the USFWS under these two laws.

1.7.2 Compliance with Other Federal Laws.

Several other federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

1.7.2.1 National Environmental Policy Act (NEPA)

WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action in Kansas.

1.7.2.2 Endangered Species Act (ESA)

It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the U.S. Fish & Wildlife Service (USFWS) to use the expertise of the USFWS to ensure that "*any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available*" (Sec.7(a)(2)). WS obtained a Biological Opinion (BO) from USFWS in 1992 describing potential effects on T & E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1994, Appendix F). WS initiated formal consultation with the USFWS on several species not covered by the 1992 BO and the results of that consultation are pending. In addition, WS is in the process of initiating formal consultation at the programmatic level to reevaluate the 1992 BO and to fully evaluate potential effects on T&E species listed or proposed for listing since the 1992 FWS BO.

1.7.2.3 Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as amended.

The Migratory Bird Treaty Act (MBTA) provides the USFWS regulatory authority to protect families of birds that contain species which migrate outside the United States. The law prohibits any "*take*" of these species by private entities, except as permitted by the USFWS; therefore the USFWS issues permits to private entities for reducing bird damage.

WS provides assessments for persons experiencing migratory bird damage to obtain information on which to base damage management recommendations. Damage management recommendations could be in the form of technical assistance or operational assistance. In severe cases of bird damage, WS provides recommendations to the USFWS for the issuance of depredation permits to private entities. The ultimate responsibility for issuing such permits rests with the USFWS. Starlings, feral domestic pigeons, house sparrows and domestic waterfowl are not classified as protected migratory birds and therefore have no protection under this Act. USFWS depredation permits are also not required to kill yellow-headed, red-winged, rusty, and Brewer's blackbirds, cowbirds, all grackles, crows, and magpies found committing or about to commit depredation upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance (50 CFR 21.43).

1.7.2.4 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical pesticide products used or recommended by the WS program in Kansas are registered with and regulated by the EPA and KDA and are used by WS in compliance with labeling procedures and requirements.

1.7.2.5 National Historic Preservation Act (NHPA) of 1966 as amended

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), require federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. WS actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties. Potential WS activities as described herein would not cause ground disturbances nor would they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. Harassment techniques that involve noise-making could conceivably disturb users of historic properties if they were used at or in close proximity to such properties; however, it is not expected that any use of these devices at livestock feeding facilities would occur in close proximity to such a property. Also, the use of such devices is generally short term and could be discontinued if any conflicts with historic properties arose. WS has determined BDM actions at livestock feeding facilities are not undertakings as defined by the NHPA because such actions do not have the potential to result in changes in the character or use of historic properties. A copy of this EA is being provided to each American Indian tribe in the State to allow them opportunity to express any concerns that might need to be addressed prior to a decision.

1.7.2.6 Environmental Justice and Executive Order 12898 - *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"*

Environmental Justice has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Executive Order 12898 requires Federal agencies to make Environmental Justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. A critical goal of Executive Order 12898 is to improve the scientific basis for decision-making by conducting assessments that identify and prioritize environmental health risks and procedures for risk reduction. Environmental Justice is a priority both within USDA/APHIS and WS. APHIS plans to implement Executive Order 12898 principally through its compliance with the provisions of NEPA.

WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to ensure Environmental Justice. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. All chemicals used by APHIS-WS are regulated by the EPA through the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the CDA, by MOUs with Federal land managing agencies, and by WS Directives. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used following label directions, they are highly selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1994, Appendix P). The WS operational program properly disposes of any excess solid or hazardous waste. It is not anticipated that any activities proposed herein would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

1.7.2.7 Executive Order 13112 – Invasive Species

Executive Order 13112 issued February 3, 1999 directs federal agencies whose actions might affect invasive species to prevent the spread of or to control such species where practical and where it can be done within budgetary constraints. The Order established an Invasive Species Council and directed the development of an Invasive Species Management Plan to guide management and control of invasive species. The Plan is currently still being developed. Nevertheless, removal of starlings, house sparrows, or feral domestic pigeons, which are all nonnative species, would be in concert with the overall aims of EO 13112.

2.0 CHAPTER 2: ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of mitigation measures and/or standard operating procedures, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional description of affected environments will be incorporated into the discussion of the environmental impacts in Chapter 4.

2.1 Issues. The following issues have been identified as areas of concern requiring consideration in this EA. These will be analyzed in detail in Chapter 4:

- Effects on target bird species populations
- Effects on nontarget species populations, including T&E species
- Effects on human health and safety
- Effects on water quality/wetland ecosystems
- Effects on aesthetic values of wild bird species
- Humaneness of lethal bird control methods

2.2 Issues Addressed in the Analysis of Alternatives

2.2.1 Effects on Target Bird Species Populations

A common concern among members of the public is whether wildlife damage management actions adversely affect the viability of target species populations. The target species selected for analysis in this EA are species that are known to cause damage at livestock feeding facilities: blackbird species, nonnative European starlings and English (or House) sparrows (both nonindigenous exotic), and feral domestic pigeons (also a nonindigenous exotic).

2.2.2 Effects on Nontarget Species Populations, Including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the impact of damage control methods and activities on nontarget species, particularly Threatened and Endangered Species. WS's standard operating procedures include measures intended to mitigate or reduce the effects on nontarget species populations and are presented in Chapter 3.

Special efforts are made to avoid jeopardizing Threatened and Endangered Species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of BDM methods on T&E species and has obtained a Biological Opinion (BO). For the full context of the BO, see Appendix F of the WS EIS (USDA 1994, Appendix F). WS is also in the process of reinitiating Section 7 consultation at the program level to assure that potential effects on T&E species have been adequately addressed. An evaluation of potential effects on T&E species is contained in this EA.

In contrast to adverse impacts on nontarget animals from direct take by BDM methods, some nontarget species may actually benefit from BDM. Prime examples are the benefit to native cavity nesting bird species that results from any reduction in starling populations or the benefit to a number of bird species, including some T&E species, that results from reductions in populations of brown-headed cowbirds which parasitize nests of other birds.

2.2.3 Effects on Human Health and Safety

2.2.3.1 Impacts on Human Health and Safety of Chemical BDM Methods.

WS has obtained input from members of the public in other areas who have expressed concerns that chemical BDM methods should not be used because of potential adverse effects on people from being exposed to the chemicals directly or to birds that have died as a result of the chemical use. Under the alternatives proposed in this EA, the primary toxicant proposed for use by WS is DRC-1339, which would be primarily used to kill blackbirds, starlings, and feral domestic pigeons causing damage at livestock feeding facilities. It is also expected to become available for use by certified applicators as Starlicide, a ready-use bait product comprised of DRC-1339 on poultry pellets (M. O'Bryan, PM Resources, pers. comm. 2000). DRC-1339 use is regulated by the EPA through FIFRA, by Kansas Pesticide law, and by WS Directives. Another chemical method that would not be used by WS but the use of which might become more prevalent under several of the alternatives is Avitrol which is classified as an avian distressing agent and is normally used to avert certain bird species from using certain problem areas. Still other chemicals that might be used include repellents, should any become registered and approved for use at livestock feeding facilities.

2.2.3.2 Impacts on Human Safety of Nonchemical BDM Methods

Some people may be concerned that WS's use of firearms and pyrotechnic bird scaring devices could cause injuries to people. WS personnel occasionally use small caliber firearms or air rifles and shotguns to remove feral domestic pigeons that are causing damage, and could use such firearms to remove birds in damage situations at livestock feeding facilities. There is some potential fire hazard to private property from pyrotechnic use.

2.2.4 Effects on Water Quality and Wetland Ecosystems

2.2.4.1 Potential for Chemicals Used in BDM to Run off Site and Affect Aquatic Organisms

An issue raised during interagency discussions was the potential for BDM chemicals to affect water quality to the point that adverse effects on humans or aquatic organisms might occur. This issue overlaps with "effects on human health" identified in section 2.2.3.1. The potential for adverse effects on human health due to contamination of water supplies will be covered in the analysis for that issue.

2.2.4.2 Potential to Cause Accelerated Eutrophication of Wetland Areas.

This latter concern is based on the possibility that carcasses of birds killed by lethal control actions might significantly increase nutrients in marsh roosting areas, resulting in accelerated eutrophication. Eutrophication is the natural process by which lakes and ponds age and become more productive in terms of the amount of life (i.e.,"biomass") they can support. If this process is accelerated by man-caused activities that increase nutrients in an aquatic ecosystem, the increased amount of plant material that is produced as a result may lead to increases in decomposition of organic material which can reduce oxygen content in the water and lead to loss of certain species in the area or changes in species composition.

2.2.5 Effects on Aesthetic Values of Wild Bird Species

Some individual members or groups of wild and feral domestic bird species habituate and learn to live in close proximity to humans. Some people in these situations feed such birds and/or otherwise develop emotional attitudes toward such animals that result in aesthetic enjoyment. In addition, some people consider individual wild birds as "pets," or exhibit affection toward these animals. Examples would be people who visit a city park to feed waterfowl or pigeons and homeowners who have bird feeders or bird houses. Many people do not develop emotional bonds with individual wild animals, but experience aesthetic enjoyment from observing them.

Public reaction to damage management actions is variable because individual members of the public can have widely different attitudes toward wildlife. Some individuals that are negatively affected by wildlife support removal or relocation of damaging wildlife. Other individuals affected by the same wildlife may oppose removal or relocation. Individuals unaffected by wildlife damage may be supportive, neutral, or opposed to wildlife removal depending on their individual personal views and attitudes.

Some people believe nuisance blackbirds, starlings, or other birds should not be killed or even harassed to stop or reduce damage problems.

2.2.6 Humaneness and Animal Welfare Concerns of Methods Used by WS.

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if *" . . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*

Suffering is described as a *" . . . highly unpleasant emotional response usually associated with pain and distress."* However, suffering *" . . . can occur without pain . . . ,"* and *" . . . pain can occur without suffering . . . "* (AVMA 1987). Because suffering carries with it the implication of a time frame, a case could be made for assuming that methods that result in *" . . . little or no suffering where death comes immediately . . . "* (CDFG 1991), such as shooting, are relatively humane. However, some people will likely refuse to accept such a conclusion.

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would *" . . . probably be causes for pain in other animals . . . "* (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991).

Pain and suffering, as it relates to WS damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since *" . . . neither medical or veterinary curricula explicitly address suffering or its relief"* (CDFG 1991).

Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found to be practical, a certain amount of animal suffering could occur when some BDM methods are used in situations where nonlethal damage management methods are not practical or effective.

WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology, workforce and funding. Mitigation measures/SOPs used to maximize humaneness are listed in Chapter 3.

2.3 Issues Considered but Not in Detail with Rationale

2.3.1 Potential for Avian Cholera and Botulism to Result from Killing Blackbirds

Concern has been expressed that if WS personnel kill blackbirds with DRC-1339 and the blackbirds subsequently die in wetland roosting areas, there would be an increased risk of avian botulism and avian cholera.

Avian botulism. Avian botulism is a paralytic disease of birds resulting from ingestion of toxin produced by the bacterium, *Clostridium botulinum* (Rosen 1971, Locke and Friend 1987). Seven distinct types of botulism toxins, designated by the letters A through G, have been identified; waterfowl die-offs from botulism are usually caused by Type C toxin (Locke and Friend 1987). Many species of birds and some mammals are affected by Type C botulism in the wild. Waterfowl, shorebirds and gulls are most commonly affected and songbirds are only infrequently affected (Locke and Friend 1987). However, not enough is known about avian botulism to precisely identify the factors leading to an outbreak (Locke and Friend 1987). Many botulism outbreaks occur on the same wetland year after year, and within a wetland there may be localized "*hot spots*." Also, outbreaks often follow a fairly consistent and predictable time frame (Locke and Friend 1987).

Most outbreaks occur west of the Mississippi River usually during late summer from July through September. The *C. botulinum* bacterium persists in wetlands in a spore form that can persist for many seasons since it is resistant to heat and drying (Locke and Friend 1987). The primary factors that contribute to the onset and maintenance of avian botulism outbreaks include water quality, depth and fluctuations, rotting vegetation, presence of invertebrate and vertebrate carcasses, high fly populations, and high ambient temperatures (above 77F^{o}) (Rosen 1971, Locke and Friend 1987). Onset usually occurs following fluctuating water levels during the hot summer months which can produce high mortality in the invertebrate fauna and this in turn could initiate rapid bacterial growth and toxin production within the wetland. Once animals begin to die of the toxins, their carcasses are the source of further amplification in fly maggot-bird transmission cycles (Reed and Rocke 1992); a single waterfowl carcasses can produce several thousand infected maggots. Consumption of just a few of these maggots can intoxicate a duck. Outbreaks generally occur from July through September. Management of the environmental conditions in the wetlands, especially water levels, and early and continuous clean-up and incineration of botulism-killed waterfowl carcasses are recommended to prevent and/or control avian botulism outbreaks (Locke and Friend 1987). In addition, the occurrence of carcass-maggot cycles of botulism is dependent on a number of factors in addition to the presence of carcasses with botulism spores, including: fly density, and environmental conditions that facilitate fly egg-laying, maggot development, and maggot dispersal from carcasses (Reed and Rocke 1992).

There is little information available on infection or mortality of songbirds, including blackbirds, from avian botulism, but songbirds are generally infrequently affected by this bacterial toxin (Locke and Friend 1987). If numbers of blackbird carcasses were added to a wetland in the winter as a result of BDM activities, it is unlikely that it would result in increased risk of avian botulism to the waterfowl present in the same wetlands in spring and summer. This is mainly because of the cold ambient temperatures and lack of sufficient flies to produce a bird-maggot amplification cycle during winter (Locke and Friend 1987). Most carcasses would be eliminated within a few days through consumption by scavengers or, when temperatures rose above freezing, by decomposition in a few days or a week. This should occur long before summer temperatures rise to levels needed for botulism outbreaks. Also, most of the blackbird carcasses would be located in the dense cattail stands where nighttime roosting occurs which means that, even if they were still present by July, they and any associated maggots, would generally not be available to expose feeding waterfowl and contribute to increased botulism risk. There is no evidence to suggest that the blackbird carcasses themselves could initiate rapid bacterial growth and amplification of bird-maggot transmission. Thus, it is unlikely that increased risk of avian botulism would result from any type of BDM activity anticipated to occur at livestock feeding facilities.

Avian Cholera. The following information was provided by R. McLean, Director, National Wildlife Health Center, Madison, WI, and is based on information summarized from Friend (1999).

> Most species of birds and mammals can become infected with the bacteria, *Pasteurella multocida*, that causes avian cholera. The majority of the bird species are susceptible to the clinical disease when exposed to virulent strains of this bacterium. Avian cholera commonly occurs in waterfowl and major die-offs occur almost yearly, whereas, it occurs less frequently with only occasional die-offs in coots and scavenging gulls and crows. There are only a small number of reports in shorebirds, cranes and songbirds. Losses can occur anytime of year, but predictable seasonal patterns exist in areas where avian cholera has become well established as a disease of wild waterfowl, particularly in waterfowl movement corridors west of the Mississippi River. Transmission occurs by direct bird-to-bird contact or by ingestion of contaminated food or water and possibly by aerosols. Transmission is enhanced by the gregarious nature of most waterfowl species and by dense concentrations of migratory water birds. The bacteria can persist in water for several weeks, in soil for up to 4 months and in decaying bird carcasses for at least 3 months. Acute infections in birds can result in rapid death 6 to 12 hours after exposure, therefore, early detection of outbreaks is crucial in stopping the disease. Rigorous and careful collection, removal, and incineration of waterfowl carcasses is recommended to control the outbreaks and to reduce exposure of scavenging birds.

Preliminary results from studies conducted by the National Wildlife Health Center indicate that wetlands are probably not an important reservoir for maintaining the bacteria that causes avian cholera (NWHC 1998). There is little evidence of infection of blackbirds with *P. multocida* bacteria nor is there any evidence of their involvement in avian cholera outbreaks. The risk of exposing waterfowl to avian cholera from the presence of blackbird carcasses in the dense cattail marsh habitat where most are likely to occur is considered low.

2.3.2 Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area.

Some individuals might question whether preparing an EA for an area as large as Kansas would meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of federal or other agency actions in which the exact timing or location of individual activities cannot generally be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. The WS program is analogous to other agencies or entities with damage management missions such as fire and police departments, emergency clean-up organizations, insurance companies, etc. Although WS can predict some of the possible locations or *types* of situations and sites where some kinds of wildlife damage will occur, the program cannot predict the specific locations or times at which affected resource owners will determine a bird damage problem has become intolerable to the point that they request assistance from WS. If a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire State may provide a clearer and more efficient analysis than multiple EA's covering smaller zones.

2.3.3 WS's Impact on Biodiversity

The WS program does not attempt to eradicate any species of native wildlife in Kansas. WS operates in accordance with international, federal, and state laws and regulations enacted to ensure species viability. Impacts on target and nontarget species populations because of WS's lethal BDM activities are minor as shown (see Section 4.1). The impacts of the current WS program on biodiversity are not significant nationwide or statewide (USDA 1994). In the case of local populations of nonnative species such as feral domestic pigeons, starlings, or house sparrows, the goal may be to eliminate a local population, but because such species are not part of the mix of native wildlife species, they are not an essential component of the native biodiversity. Rarely, if ever, would BDM result in the long term local elimination of even these nonnative species, however.

2.3.4 Wildlife Damage Is a Cost of Doing Business -- a "Threshold of Loss" Should Be Established Before Allowing Any Lethal Bird Damage Management.

WS is aware that some people feel federal wildlife damage management should not be allowed until economic losses reach some arbitrary pre-determined threshold level. Although some damage can be tolerated by most resource owners, WS has the legal direction to respond to requests for wildlife damage management, and it is program policy to aid each requester with the goal of minimizing or preventing losses. WS uses the Decision Model thought process discussed in Chapter 3 to determine appropriate strategies.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie NF, et al., the United States District Court of Utah denied plaintiffs' motion for preliminary injunction. In part the court found that a forest supervisor need only show that damage from wildlife is threatened to establish a need for wildlife damage management (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as percentage of loss of a particular resource to justify the need for wildlife damage management actions.

2.3.5 Wildlife Damage Management Should Not Occur at Taxpayer Expense, but Should Be Fee Based.

WS is aware of concerns that wildlife damage management should not be provided at the expense of the taxpayer or that it should be fee based. WS was established by Congress as the agency responsible for providing wildlife damage management to the people of the United States. Funding for WS comes from a variety of sources in addition to federal appropriations. Such nonfederal sources include State general appropriations, local government funds (county or city), livestock associations, Indian tribes, and private funds which are all applied toward program operations. Federal, state, and local officials have decided that WS should be conducted by appropriating funds. Additionally, wildlife damage management is an appropriate sphere of activity for government programs, since wildlife management is a government responsibility. A commonly voiced argument for publicly funded wildlife damage management is that the public should bear at least some of the responsibility for damage to private property caused by public wildlife.

Although not required by law, it is current practice of the KS WS program to require service recipients (i.e., those that contribute cooperative funding) to pay for labor and materials used in operational BDM activities. Technical assistance not requiring on-site work and materials is provided free of cost to the recipient. Thus, BDM by WS is fee based depending on level of service.

2.3.6 American Indian and Cultural Resource Concerns

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to, among other things, consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. WS actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties. In addition, the predecision EA was sent to all tribes in the State to solicit their review and comment prior to issuing a decision. As stated in Section 1.7.2.5, WS BDM actions do not cause ground disturbances nor do they otherwise have the potential to affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA.

2.3.7 Environmental Justice and Executive Order 12898 - *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."*

Environmental Justice (EJ) is a movement promoting the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. EJ, also known as Environmental Equity, has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status.

EJ is a priority both within APHIS and WS. Executive Order 12898 requires Federal agencies to make EJ part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. APHIS plans to implement Executive Order 12898 principally through its compliance with the provisions of NEPA.

All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to insure EJ. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. It is not anticipated that the proposed action or any alternative would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

2.3.8 Lethal BDM for Blackbirds and Starlings Is Futile Because 50-60% of Them Die Each Year Anyway.

Because natural mortality in blackbird populations is 50 - 65% per year (see section 4.1.1.1), some persons argue that this shows lethal BDM actions are futile. However, the rate of natural mortality has little or no relationship to the effectiveness of lethal BDM because natural mortality generally occurs randomly throughout a population and throughout the course of a year. Natural mortality is too gradual in individual concentrations of depredating birds to adequately reduce the damage that such concentrations are causing. It is probable that mortality caused by BDM actions is not additive to natural mortality but merely displaces it (known as "compensatory" mortality). In any event, it is apparent that the rate of mortality from BDM is well below the extent of any natural fluctuations in overall annual mortality and is, therefore, insignificant to regional populations. The objective of lethal BDM in the alternatives analyzed in this EA is not to necessarily add to overall blackbird or starling mortality, which would be futile under current funding limitations, but to redirect mortality to a segment of the population that is causing damage in order to realize benefits during the current production season. The resiliency of these bird populations does not mean individual BDM actions are not successful in reducing damage, but that periodic and recurring BDM actions are necessary in many situations.

2.3.9 Cost Effectiveness of BDM.

Perhaps a better way to state this issue is by the question "Does the value of damage avoided equal or exceed the cost of providing BDM?" The Council on Environmental Quality (CEQ) regulations (40 CFR 1502.23) do not require a formal, monetized cost-benefit analysis to comply with NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. The WS FEIS, Appendix L, p. 32 (USDA 1994) stated:

> Cost effectiveness is not, nor should it be, the primary goal of the APHIS ADC program. Additional constraints, such as environmental protection, land management goals, and others, are considered whenever a request for assistance is received. These constraints increase the cost of the program while not necessarily increasing its effectiveness, yet they are a vital part of the APHIS ADC program.

An analysis of cost-effectiveness in many BDM situations is exceedingly difficult if not impossible to perform because the value of benefits is not readily determined. For example, the potential benefit of eliminating feral domestic pigeons from roosting and nesting around heating and cooling structures on a school or hospital could be reduced incidence of illness among an unknown number of building users. Since some of the bird-borne diseases described in Chapter 1 are potentially fatal or severely debilitating, the value of the benefit may be high. However, no studies of disease problems with and without BDM have been conducted, and, therefore, the number of cases *prevented* by effective BDM is not possible to estimate. Also, it is rarely possible to conclusively prove that birds are responsible for individual disease cases or outbreaks.

The WS program in Arizona prepared an analysis of cost vs. avoided loss for feedlot and dairy operations that received BDM service. The analysis indicated that the value of feed saved from blackbird and starling damage by BDM with DRC-1339 exceeds the cost of the service by a factor of 3 to 1, without considering other benefits such as prevention of disease transmission, restored weight gain performance, and milk yields (USDA 1996). A similar analysis in Idaho yielded a ratio of avoided losses to cost of about 4 to 1 (USDA 1998). Although not available for Kansas livestock feeding facilities because this type of BDM has been extremely limited, the AZ and ID analyses indicate blackbird and starling control at dairies and feedlots is cost-effective.

An agency reviewer suggested that a rigorous cost:benefit analysis of all possible combinations of nonlethal and lethal alternatives would demonstrate that costs of lethal BDM are greater than of implementing most if not all nonlethal BDM. The KS WS program does not currently have the resources to conduct such a cost:benefit analysis. However, the following brief analysis of 2 hypothetical alternative strategies can shed some light on this subject. Typical cost for conducting one DRC-1339 treatment would be as follows:

DRC-1339 Technical powder @ $350 per pound (1.0 lb/treatment)	$350
Bait material @ $8/ 50 lb (ave. 500 lb/treatment)	$80
Treatment Labor - one WS employee @ 6 hrs./treatment @ $33/hr	$198
Followup monitoring and bird retrieval labor cost - 8 hrs. @ $33/hr	$264
Vehicle mileage and Per Diem (ave. $200/treatment)	$200
Total cost per treatment	$1,092
Total facility cost @ average of 8 treatments per year (estimated - actual treatments expected to be less due to reduce local bird populations)	$8,736

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In comparison, one estimate of the cost of implementing a shooting and harassment program at a 60-100-acre facility is as follows:

20 propane exploders (as recommended by Williams 1983) w/ rotary stands and 20 lb propane bottles@ $600/ea., $12,000 prorated over 5 years - annual cost	$2,400
Opportunity cost of funds to buy propane exploder equip. @7%/yr	$168
Propane @ $6/fill-up/bottle, 2 weeks/fill-up, over 18 weeks	$1,080
Labor - 5 hired personnel @$6/hr for 5 - 8-hr days /week, with treatment every third week over 18-week season	$7,200
Ammunition: 50 rds 12 ga. shotshells at $.15 ea per day per person	$1,125
Pyrotechnics (ave. 25 rounds/person/day @ $.35/rd)	$1,312
Total facility cost per year	$13,285

In terms of effectiveness, published information indicates an aggressive scaring program (Williams 1983) can be about as effective as use of DRC-1339 (Besser et al. 1967; Glahn 1982). However, the Williams (1983) study was in South Texas where the climate is relatively warm in winter. Johnson and Glahn (1994) stated that scaring programs for starlings at feedlots are probably less effective in colder climates than in warmer climates, because snow frequently covers alternative food sources in winter in the more northern latitudes. Therefore, it is expected that scaring programs would be somewhat less effective than DRC-1339 treatments at Kansas facilities.

Also, an important cost/benefit consideration of implementing scaring programs is whether the birds would be expected to simply relocate to other facilities (Johnson and Glahn 1994), requiring more facility managers to resort to the costs of scaring or other control programs. Thus, the overall cost of bird damage management at multiple facilities within broader localized areas could be expected to be greater with purely nonlethal strategies than under strategies in which the damaging birds could be removed.

Starling-proof netting-type barrier material costs from about $.04 to $.30 per square foot just for the netting material which has an expected life span of about 7-10 years[3]. This calculates to about $160,000 to $1.3 million for enough material to cover a 100 acre facility which does not include the cost of poles, cable, mounting hardware, and labor to install. If prorated over the expected life span and added to the investment opportunity or interest cost[4] of the initial investment capital outlay, the cost of the netting material alone would be in the range of $27,000 to $275,000 per year. Netting barriers would most likely not be practical to maintain over the large areas occupied by many feeding facilities, because they would have to withstand winter snow loads, ice storms, and occasional high winds.

Construction of indoor feeding pens of the sizes needed would undoubtedly cost many millions of dollars - e.g., if it is conservatively assumed that the type of construction needed would only cost $20/square foot, the cost to house 100 acres of feeding pens would be more than $87 million. The annual opportunity or interest cost alone, not including capital depreciation, of that kind of capital outlay would be more than $6 million per year[5]. This strategy would clearly not be competitive with other means of controlling bird damage.

This brief comparison suggests several of the more likely to be suggested alternative nonlethal strategies

[3]Information from Biocontrol Network website - www.biconet.com and Bird-X website - www.bird-x.com.

[4]Assumes annual rate of return on alternative investment or cost of borrowed funds would be about 7%.

[5]Assumes annual rate of return on alternative investment or cost of borrowed funds would be about 7%.

would not be as cost-effective as use of a lethal strategy using DRC-1339. In reality, the costs of implementing scaring programs can be highly variable and may be much more or less than the annual cost shown above, depending on the size of the operation, the availability of alternate feeding sites for wintering blackbirds and starlings, and the cost of equipment, materials, and labor. Thus, hazing/harassment is expected to remain a potentially viable nonlethal component of the Integrated Wildlife Damage Management approach used or recommended by WS.

2.3.10 Beneficial Effect on Songbird Populations from Killing Brown-headed Cowbirds

A number of songbird species, some of which are listed as threatened or endangered under the Endangered Species Act of 1973 (e.g., Kirland's warbler (*Dendroica kirtlandii*); black-capped vireo (*Vireo atricapillus*), are adversely affected by nest parasitism of the brown-headed cowbird (Brittingham and Temple 1983; Robinson et al. 1992). The cowbirds lay their eggs in active nests of other bird species. The cowbird eggs hatch first and the young are cared for by the host bird as if they were its own. By the time the host birds' own eggs hatch, the cowbird young are larger and out-compete the host birds' young for food and frequently push them out of the nest. With endangered bird species, such parasitism can cause enough nest failures to jeopardize the host species. Under the proposed action, WS expects that up to about 100,000 brown-headed cowbirds would be killed. This would likely have some effect in enhancing songbird nesting success the following spring and summer, which would be considered a beneficial environmental effect. However, the extent of such a beneficial impact is unknown.

2.3.11 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045).

Children may suffer disproportionately from environmental health and safety risks for many reasons. Bird damage management at livestock feeding facilities as proposed in this EA would only involve legally available and approved damage management methods in situations or under circumstances where it is highly unlikely that children would be adversely affected. Therefore, implementation of the proposed action or other alternatives involving direct assistance by WS would not increase environmental health or safety risks to children.

3.0 CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

3.1 Description of the Alternatives

3.1.1 Alternative 1 - Lethal Control by WS at Livestock Feeding Facilities Using DRC-1339 Only

This alternative would restrict the WS program's involvement to lethal control of damaging bird species by using DRC-1339 chemical toxicant when assisting livestock feeding facilities in Kansas. DRC-1339 would be used in grain-based or other approved bait materials in accordance with EPA and State approved pesticide label directions for the product. At present, the technical grade of this chemical is only legal for use by trained and certified USDA employees or persons under their direct supervision. However, it is expected to become available as a ready-to-use bait product (Starlicide Complete - EPA registration #67517-8-59613) for use by certified applicators by January 2001 (M. O'Bryan, PM Resources, pers. comm. 2000).

3.1.2 Alternative 2 - Technical Assistance Only by WS.

This alternative would not allow for WS operational BDM at livestock feeding facilities in Kansas. WS would only provide technical assistance and make recommendations when requested. Facility managers or state agencies could conduct BDM using traps, shooting, Avitrol, Starlicide (which contains DRC-1339) or any nonlethal method that is legal. Avitrol and Starlicide could only be used by or under the direct supervision of pesticide applicators certified by the KDA to use restricted use pesticides.

3.1.3 Alternative 3 - BDM by WS at Livestock Feeding Facilities Using an Integrated Wildlife Damage Management Approach

Under this alternative, the WS program would provide a combination of technical assistance and operational BDM to reduce or minimize the loss of livestock feed and the risk of bird-related livestock health problems and damage to property presented by starlings, blackbirds, pigeons, and house sparrows at requesting livestock feeding facilities in the State. WS would have the objective of responding to all requests for assistance with, at a minimum, technical assistance or self-help advice, or, where appropriate and when cooperative or congressional funding is available, direct damage management assistance in which professional WS Specialists conduct damage management actions. An Integrated Wildlife Damage Management (IWDM) approach would be implemented which would allow use of any legal technique or method, used singly or in combination, to meet requestor needs for resolving conflicts with birds. Facility owners or managers requesting assistance would be provided with information regarding the use of nonlethal and lethal techniques believed to be effective in resolving bird damage problems at such facilities. Lethal methods used by WS would include DRC-1339, shooting, trapping, or euthanasia following live capture by trapping, hand capture, or use of nets. Nonlethal methods used or recommended by WS may include porcupine wire deterrents, wire barriers and deterrents, chemical repellents (e.g., methyl anthranilate), and harassment using noise-making or visual scaring techniques. In many situations, the implementation of nonlethal methods such as exclusion-type barriers would be the responsibility of the requestor to implement which means that, in those situations, WS only function would be to implement lethal methods if determined to be necessary – in some such situations the implementation of this alternative could be identical to Alternative 1. Operational BDM by WS would be allowed in the State, when requested, on livestock feeding facilities where a need has been identified and where an *Agreement for Control* has been completed. All management actions would comply with appropriate federal, state, and local laws.

3.1.4 Alternative 4 - Nonlethal BDM Only by WS.

This alternative would not allow any lethal BDM by WS at livestock feeding facilities. The only methods that could be operationally employed by WS would be harassment or scaring devices or installation of exclusion techniques. WS does not have the funding to construct or install exclusion devices which would be extremely costly per facility (see Section 2.3.9), so this alternative would probably only result in WS's use of scaring devices. Since most facility operators have already tried those techniques, it is likely they would not request services from WS if harassment/scaring were the only methods to be used. Facility managers or state agencies could conduct BDM using traps, shooting, Avitrol, Starlicide (which contains DRC-1339) or any nonlethal method that is legal.

3.1.5 Alternative 5 - No Federal WS BDM at Livestock Feeding Facilities (The "No Action" Alternative)

This alternative would prevent involvement by the WS program in BDM on livestock feeding facilities in Kansas. WS would not provide direct operational or technical assistance and requesters of WS services would have to conduct their own BDM without WS input. Information on BDM methods development would still be available to producers and property owners from other sources. Facility managers or state agencies could conduct BDM using traps, shooting, Avitrol, Starlicide (which contains DRC-1339) or any nonlethal method that is legal. Avitrol and Starlicide could only be used by or under the direct supervision of pesticide applicators certified by the KDA to use restricted use pesticides.

3.2 BDM Strategies and Methodologies Available to WS to Use or Recommend at Livestock Feeding Facilities in Kansas

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2, 3 and 4 described above. Alternative 5 would prevent both WS technical assistance and operational BDM by WS.

3.2.1 Integrated Wildlife Damage Management (IWDM).

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective[6] manner while minimizing the potentially harmful effects on humans, target and nontarget species, and the environment. IWDM may incorporate cultural practices (i.e., animal husbandry), habitat modification (i.e., exclusion), animal behavior modification (i.e., scaring), removal of individual offending animals, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

3.2.2 the IWDM Strategies That WS Employs.

3.2.2.1 Technical Assistance Recommendations.

"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. The implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Technical assistance may be provided following a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management

[6] The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns. It is also oftentimes difficult to measure cost-effectiveness in wildlife damage management situations.

strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application. The requestor is responsible for making the decision to implement or not implement any recommendation and generally makes the decision based on personal preferences, abilities, and/or economic concerns (e.g., whether he/she can afford the cost of implementation).

Under APHIS NEPA Implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving bird damage problems.

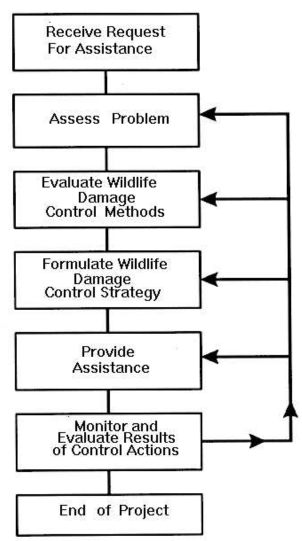
3.2.2.2 Direct Damage Management Assistance.

This is the implementation or supervision of damage management activities by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, and when *Agreements for Control* or other comparable instruments provide for WS direct damage management. The initial investigation defines the nature, history, extent of the problem, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary, or if the problem is complex. It is expected that in most situations where WS is requested to provide direct BDM assistance at livestock feeding facilities, the methods used by WS will involve lethal control or capture methods.

3.2.3 WS Decision Making.

WS personnel use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model described by Slate et al. (1992) (Figure 3-1). WS personnel are frequently contacted after requesters have tried or considered nonlethal methods and found them to be impractical, too costly, or inadequate for reducing damage to an acceptable level. WS personnel assess the problem, evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situation are developed into a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a documented process, but a mental problem-solving process common to most if not all professions.

Figure 3-1. APHIS, WS Decision Model



3.2.4 Bird Damage Management Methods Available for Use.

3.2.4.1 Nonchemical, Nonlethal Methods (See Appendix B).

Agricultural producer and property owner practices consist primarily of nonlethal preventive methods such as cultural methods[7] and habitat modification.

Animal behavior modification refers to tactics that alter the behavior of birds to reduce damages. Some but not all of these tactics include:

- Exclusions such as netting
- Propane exploders (to scare birds)
- Pyrotechnics (to scare birds)
- Distress calls and sound producing devices (to scare birds)
- Visual repellents and scaring tactics

Relocation of damaging birds to other areas.

Nest destruction of the target species before eggs or young are in the nest.

Habitat/environmental modification to attract or repel certain bird species.

Live traps are various types of traps designed to capture birds alive for relocation or euthanasia. Some examples are: clover traps, decoy traps, nest box traps, mist nets, etc. (See Johnson and Glahn 1994 for further information).

Lure crops/alternate foods are crops planted or other food resources provided to attract damage-causing wildlife away from higher value crops.

These methods are rarely, if ever, practical or effective at livestock feeding facilities. They remain available for facility managers to consider for implementation, however.

3.2.4.2 Chemical, Nonlethal Methods (See Appendix B).

Avitrol is a chemical frightening agent registered for use on pigeons, crows, gulls, blackbirds, starlings, and English sparrows in various situations. This chemical works by causing distress behavior in the birds that consume treated kernels from a mixture of treated and untreated bait, which generally frightens the other birds from the site. Generally birds that eat the treated bait will die (Johnson and Glahn 1994). WS would not use this chemical at livestock feeding facilities in Kansas, but facility managers could employ commercial pesticide applicators to use it. Other nonlethal BDM chemicals that might be used or recommended by WS if they become registered would include repellents such as methyl anthranilate (artificial grape flavoring used in foods and soft drinks sold for human consumption), which has been used as an area repellent for various species of birds and is currently being researched as a livestock feed additive, anthraquinone, and charcoal particles (e.g., adhered to livestock feed) (See Appendix B for further information on these repellent methods that show potential for future use). Some proposed repellent methods such as charcoal and limestone particle feed additives may not require EPA and KDA registration (C. Lee, KSU-CES, pers. comm., 2000).

3.2.4.3 Mechanical, Lethal Methods (See Appendix B).

Shooting is the practice of selectively removing target birds by shooting with an air rifle, shotgun, or rifle. Shooting a few individuals from a larger flock can reinforce birds' fear of harassment

[7] Generally involves modifications to the management of protected resources to reduce their vulnerability to wildlife damage..

techniques. This method is sometimes more effective as a dispersal technique than as a way to reduce starling or blackbird numbers. The number that can be killed by shooting is generally very small in relation to the number involved in damage situations. Usually only a few dozen birds can be shot from individual flocks that can number anywhere from a few hundred to many thousands or hundreds of thousands before the rest of the birds become gun shy. Shooting, however, can be helpful in some situations to supplement and reinforce other dispersal techniques. It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with rifles or shotguns is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible.

Live traps followed by euthanasia. Decoy traps are sometimes used by WS to capture blackbirds and starlings. Decoy traps may be used in limited numbers in selected locations where a resident population is causing localized damage or where other techniques cannot be used. Decoy traps are similar in design to the Australian Crow Trap as reported by Johnson and Glahn (1994) and McCracken (1972). Live decoy birds are placed in the trap with sufficient food and water to assure their survival. Feeding behavior and calls of the decoys attract other birds into the trap. Blackbirds and starlings taken in these traps are euthanized.

3.2.4.4 Chemical, Lethal Methods (See Appendix B).

DRC-1339 is a slow acting avicide for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 is highly toxic to sensitive species but only slightly toxic to nonsensitive birds, predatory birds and mammals. This chemical would be the primary lethal chemical method used for feral domestic pigeon, starling, and blackbird damage management at Kansas livestock feeding facilities. When it is used to kill blackbirds and starlings at livestock feeding facilities, most of the birds die at their nighttime roost sites. Where roost sites are in remote areas of limited or difficult access, such as cattail marshes, killed birds are not retrieved.

Avitrol (described above in Section 3.2.4.2) is a chemical frightening agent that generally is used in such a way that it only affects a small portion of targeted birds. However, correct use in accordance with the label for this product sometimes result in considerable mortality of locally targeted concentrations of blackbirds and starlings. It is thus mentioned here to clearly convey that this chemical can result in lethal control results under certain circumstances.

Carbon dioxide (CO_2) gas is an American Veterinary Medical Association (AVMA) approved euthanasia method which is sometimes used to euthanize birds which are captured in live traps or by chemical immobilization and when relocation is not a feasible option. Live birds are placed in a container or chamber into which CO_2 gas is released. The birds quickly expire after inhaling the gas.

3.3 Alternatives Considered but Not Analyzed in Detail with Rationale

Several alternatives were considered but not analyzed in detail. These were:

3.3.1 Compensation for Bird Damage Losses

This alternative would require the establishment of a system to reimburse livestock feeding facility operators for damage caused by birds. This alternative was eliminated from further analysis because no federal or state laws currently exist to authorize such action. Under such an alternative, WS would not provide any direct control or technical assistance. Aside from lack of legal authority, analysis of this alternative in the FEIS indicated that the concept has many drawbacks (USDA 1994):

- It would likely require larger expenditures of money and labor to investigate and validate all damage claims and to determine and administer appropriate compensation. Section 1.3.2 presented estimated damage values of more than $400,000 per year based only on the numbers of birds expected to be removed by BDM activities. Individual feedlot managers have estimated annual losses as high as $600,000 per year. Analysis on costs vs. avoided losses in the Arizona and Idaho WS programs showed that the value of feed losses avoided by conducting BDM at feeding facilities were 3-4 times the cost of conducting the control efforts, and this was without including the value of other unquantified types of damage such as disease problems and property damage (USDA 1996; USDA 1998).
- Compensation would most likely be below the actual value of the damage. It is difficult to make timely responses to all requests to assess and confirm damage, and certain types of damage could not be conclusively verified. For example, it would be impossible to prove conclusively in individual situations that birds were responsible for disease outbreaks even though they may actually have been responsible. Thus, a compensation program that requires verification would not meet its objective for mitigating such losses, and facility managers would most likely implement other management alternatives available to them.
- Compensation would give little incentive to resource owners to limit damage through improved cultural, husbandry, or other practices and management strategies.
- A major concern at livestock feeding facilities is lost business caused by the perceptions of customers that excessive bird use of a facility may mean lower weight gains and higher disease risks. This type of loss is difficult to prove or quantify and would likely go uncompensated.
- Not all facility managers would rely completely on a compensation program and lethal control would most likely continue as permitted by state law.

3.3.2 Short Term Eradication and Long Term Population Suppression

An eradication alternative would direct all WS program efforts toward total long term elimination or suppression of populations of bird species that cause damage at livestock feeding facilities in the State.

Eradication of native bird species (the starling, English sparrow, and feral domestic pigeon are not native to North America) is not a desired population management goal of state or federal agencies in Kansas. Although generally difficult to achieve, eradication of a local population of nonnative feral domestic pigeons, English sparrows, or starlings may be the goal of individual BDM projects. This is because these species are not native to North America and are only present because of human introduction. Suppression of localized wintering concentrations of red-winged or other blackbird species causing damage would be a goal of WS under Alternatives 1 and 3 in many situations. However, such a goal would only apply to limited areas in the vicinity of livestock feeding facilities and not to broader area-wide or region-wide populations.

Eradication as a general strategy for managing bird damage will not be considered in detail because:

- All state and federal agencies with interest in or jurisdiction over wildlife oppose eradication of any native wildlife species.
- Eradication is not acceptable to most members of the public.
- Because blackbirds and starlings are migratory and most winter populations are comprised of winter migrants from northern latitudes, eradication would have to be targeted at the entire North

American populations of these species to be successful. That would not be feasible or desirable.

A Suppression alternative would direct WS program efforts towards achieving long-term reduction of certain problem populations over broad areas, such as statewide, over an entire multi-state region, the entire migratory bird Central Flyway, or nationwide. Such broad-scale approaches are outside the scope of this EA. In areas where damage can be attributed to localized populations of birds, WS can decide to implement local population suppression as a result of using the WS Decision Model. Problems with the concept of suppression are similar to those described above for eradication.

3.3.3 Use of Bird-proof Feeders in Lieu of Lethal Control at Dairies and Cattle Feeding Facilities

A method that has been proposed through public input to WS for excluding birds at dairies and cattle feeding facilities is a "bird-proof" feeder that involves the installation of 1/8" thick steel panel feed troughs covered by parallel 4-6 inch spaced steel cables or wires running from the outer top edge of the trough up at a 30-45 degree angle to the top of the head chutes that cattle use to access the feed. Vertical canvas strips are hung from the cables. The feeder was reportedly designed for use with horses. A copy of a diagram of this system was sent to Mr. Jim Glahn, Bird Control Research Biologist, National Wildlife Research Center, who has nearly 10 years of experience researching problems caused by starlings at livestock feeding operations for opinions regarding the potential effectiveness and practicality of the feeder. Concerns expressed were:

- a major flaw in the design is the spacing of the cables at 4-6" which would allow starlings to drop through. Reducing the spacing to 2" as recommended by Johnson and Glahn (1994) might interfere with the delivery of some forms of feed to the troughs. Rations that contain alfalfa or corn silage portion would likely hang up on the cable or wire strands of the troughs and much would fall outside the troughs, with increased feed waste a result.

- the spacing of the canvas strips is not specified, and canvas would deteriorate quickly from cattle licking and weather.

Other concerns include:

- the cable/wire barriers would likely hinder the application of injectable medicines at dairies that use "lockup" type feeding chutes that restrain the cows by the head and neck for this purpose.

- feed consumption might be reduced, at least temporarily, due to reluctance of cows to put their heads into a semi-enclosed environment.

- the cost of conversion to the suggested feed trough design would likely be substantial. For example, one known feedlot in the State has approximately 3-4 miles of feed bunks that would have to be modified. Most dairy/feedlot managers would be reluctant to convert considering initial cost and the added inconveniences discussed above.

Mr. Glahn expressed the opinion, based on Twedt and Glahn (1982) and Feare (1984), that exclusion methods to reduce starling depredations at livestock feeding operations is usually the least cost-effective solution.

Despite the above concerns about the bird-proof feeder system described above, similar type systems could be recommended by WS under alternatives 2 and 3 should any become available that are effective, practical, and economically feasible for producers to implement. For example, dairy industry representatives from Kansas recently toured some European dairies that use clear plastic strips to exclude birds from free stall barns and report the method is cost-effective (C. Lee, KSU-CES, pers. comm., 2000). These types of systems could be implemented by facility operators as part of an integrated program of abating bird damage problems.

3.3.4 Nest and Roost Habitat Alteration

An alternative sometimes considered in many wildlife damage situations is alteration of wildlife habitat in areas where or near to where damage is occurring to reduce the attractiveness of such areas to species that cause damage. The manipulation of cattail roost sites where blackbirds and starlings roost at night was considered as a possible remedy for damage by these species at livestock feeding facilities. WS does not have the authority to conduct or require habitat alteration in such areas. Nevertheless, this alternative may, at some point in the future, be a viable alternative if agreed to by managers or owners of areas where roost sites are located.

Manipulation of nesting habitat areas was suggested by one commenting agency as a possible way to reduce bird problems at livestock feeding facilities. However, evidence from Meanley (1971) and Knittle et al. (1987) indicates most wintering blackbirds and starlings in the midwestern U.S. nest at more northern latitudes across broad areas of North America. To alter nest habitat across such a broad area is outside the scope of strategies capable of being implemented by the Kansas WS program.

3.4 Mitigation and Standard Operating Procedures for Bird Damage Management Techniques Used at Livestock Feeding Facilities

3.4.1 Mitigation in Standard Operating Procedures (SOP's)

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current nationwide WS program uses many such mitigation measures and these are discussed in detail in Chapter 5 of the FEIS (USDA 1994). Some key mitigating measures pertinent to the proposed action and alternatives that are incorporated into WS's Standard Operating Procedures include:

- The WS Decision Model thought process which is used to identify effective wildlife damage management strategies and their impacts.
- Reasonable and prudent measures or alternatives are identified through consultation with the USFWS and are implemented to avoid impacts to federally listed T&E species.
- EPA-approved label directions are followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse impacts to the environment when chemicals are used in accordance with label directions.
- All WS personnel in the State who use restricted chemicals are trained and certified under State and federal pesticide laws.
- The presence of nontarget species is monitored before using DRC-1339 to control starlings and blackbirds at feedlots to reduce the risk of significant mortality of nontarget species populations.
- Research is being conducted to improve BDM methods and strategies so as to increase selectivity for target species, to develop effective nonlethal control methods, and to evaluate nontarget hazards and environmental impacts.

Some additional mitigating factors specific to the current program include:

- Management actions would be directed toward localized populations or groups of target species and/or individual offending members of those species. Generalized population suppression across the State, or even across major portions of the state, would not be conducted.
- WS uses BDM devices and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1994, Appendix P). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazard to the public is even further reduced.

3.4.2 Additional Mitigation Specific to the Issues

The following is a summary of additional mitigation measures that are specific to the issues listed in Chapter 2 of this document.

3.4.2.1 Effects on Target Species Populations

- BDM activities are directed to resolving bird damage problems by taking action against individual problem birds, or local populations or groups, not by attempting to eradicate populations in the entire area or region.
- WS take is monitored by comparing numbers of birds killed by species or species group (e.g., blackbirds) with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (See Chapter 4).

3.4.2.2 Effects on Nontarget Species Populations Including T&E Species

- Observations of birds at livestock feeding facilities are made to determine if nontarget or T & E species would be at significant risk from BDM activities.
- WS has consulted with the USFWS regarding potential impacts of control methods on T&E species, and abides by reasonable and prudent alternatives (RPAs) and/or reasonable and prudent measures (RPMs) established as a result of that consultation. For the full context of the Biological Opinion see the WS FEIS, Appendix F (USDA 1994). Further consultation on species not covered by or included in that formal consultation process has been initiated with the USFWS and WS will abide by any RPAs, RPMs, and terms and conditions that result from that process to avoid jeopardizing any listed species.
- WS uses chemical methods for BDM that have undergone rigorous research to prove their safety and lack of serious effects on nontarget animals and the environment.

3.4.2.3 Effects on Aesthetics

- WS would plan to retrieve, or arrange for the retrieval of, visible dead birds following baiting operations (this depends on receiving permission to trespass by property owners).

4.0 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose of the proposed action. The chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2.

The following resource values within the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, flood plains, visual resources, air quality, prime and unique farmlands, timber, and range. These resources will not be analyzed further.

Cumulative Impacts: Discussed in relationship to each of the potentially affected species analyzed in this chapter.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Impacts on sites or resources protected under the National Historic Preservation Act: WS BDM actions are not undertakings that could adversely affect historic resources (See Section 1.7.2.5).

4.1 Environmental Consequences for Issues Analyzed in Detail

4.1.1 Effects on Target Species Bird Populations

4.1.1.1 Alternative 1 - Lethal Control by WS at Livestock Feeding Facilities Using DRC-1339 Only.

Analysis of this issue is limited primarily to those species that would be killed during WS BDM at livestock feeding facilities in Kansas. The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1994). Magnitude is described in USDA (1994) as " . . . *a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose populations are high and usually only after they have caused damage.

European starlings were introduced to North America in March 1890 by a Mr. Eugene Scheifflin, a member of the Acclimatization Society, who released 80 of the birds into New York's Central Park. By 1918, the advance line of migrant juveniles extended from Ohio to Alabama; by 1926 from Illinois to Texas; by 1941 from Idaho to New Mexico; and by 1946 to California and Canadian coasts (Miller 1975). In just 50 years the starling had colonized the United States and expanded into Canada and Mexico and 80 years after the initial introduction had become one of the most common birds in North America (Feare 1984).

Precise counts of blackbird and starling populations do not exist but one estimate placed the United States summer population of the blackbird group at more than one billion (USDA 1994) and the winter population at 500 million (Royall 1977). The majority of these birds occur in the eastern U.S.; for example surveys in the southeastern part of the country estimated 350 million blackbirds and starlings in winter roosts (Bookhout and White 1981). Meanley and Royal (1976) estimated 538 million blackbirds and starlings in winter roosts across the country during the winter of 1974-75.

Knittle et al. (1987) documented 86% of marked red-winged blackbirds dispersing from spring roosts in Missouri and southeastern South Dakota migrated to breeding sites in the western Minnesota, North Dakota, and eastern South Dakota, and provided evidence that some redwings emanating from spring roosts in the central U.S. breed in Canada. Therefore, it is probable that a majority of the blackbirds and starlings that winter in Kansas and cause damage at livestock feeding facilities are from migrating populations within the Central Flyway as identified by the U.S. Fish and Wildlife Service (Figure 4-1). However, band return data analyzed in Meanley (1971) indicates wintering blackbirds may be migrating from areas across much of North America (see population impacts analysis for blackbird species below).

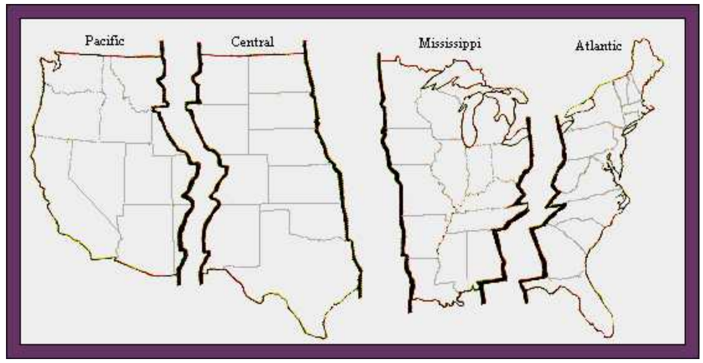


Figure 4-1. Migratory bird flyways as identified by the U.S. Fish and Wildlife Service.

<u>Starling Population Impacts</u>

The nationwide starling population has been reported to be about 140 million (Johnson and Glahn 1994). Winter starling populations in the western and eastern U.S. have been estimated at more than 11 million and 98 million, respectively (Meanley and Royall 1976). Natural mortality in starling and blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1994).

Breeding Bird Survey (BBS) data from Sauer et al. (2000) indicate the starling breeding population in the central BBS region was relatively stable from 1966 -1998. BBS data for Kansas indicates starling populations stable to slightly decreasing for that same time period (Sauer et al. 2000). Appendix C shows BBS and Christmas Bird Count (CBC) data (not available for all species) for species that may be taken under the proposed action.

Under the proposed action and Alternative 1, it is estimated that up to 3 million starlings would be killed by WS BDM activities at livestock feeding facilities. This would amount to about 2-3% of the starling population in North America and only 4-5% of the annual natural mortality of this species. Starlings are not involved to a substantial degree in blackbird control programs in the Dakotas or in the southern rice producing states (G. Linz, A. Wilson, and G. McEwen, APHIS-WS, pers. comm., 2000), which are the primary areas where other known blackbird control activities would most likely be conducted. Thus, cumulative effects on the overall starling population would not be enough to affect the population substantially.

Because starlings are not native to North America, they are not part of the native biodiversity. Also, detrimental impacts of starlings on other species have been well documented. Nest competition has been identified as a major contributor to the depletion of the eastern bluebird (*Sialis sialis*) population (Miller 1975; Barnes 1991), as having an adverse impact on sparrow hawks (American kestrell (*Falco sparverius*) (Nickell 1967; Von Jarchow 1943; Wilmers 1987), red-bellied woodpeckers (*Centurus carolinus*), Gila woodpeckers (*Centurus uropygialis*) (Ingold 1994; Kerpez et.al. 1990), and wood ducks (*Aix sponsa*) (Shake 1967; Heusmann et.al. 1977; Grabill 1977; McGilvrey et.al 1971). Weitzel (1988) reported 9 native species of birds in Nevada had been displaced by starling nest competition, and Mason et al. (1972) reported starlings evicting bats from nest holes. For these reasons, a reduction in starling populations in

North America would be considered by many persons to be a beneficial impact on the human environment. It would also be in accordance with the spirit of Executive Order 13112 (see section 1.7.2.7).

Blackbird Population Impacts

The most recent information on blackbird populations available for this analysis is breeding bird and fall population estimates made for the northern prairie region by the National Wildlife Research Center field office at Bismark, North Dakota (Table 4-1). The estimates are for the area shown in Figure 4-2.

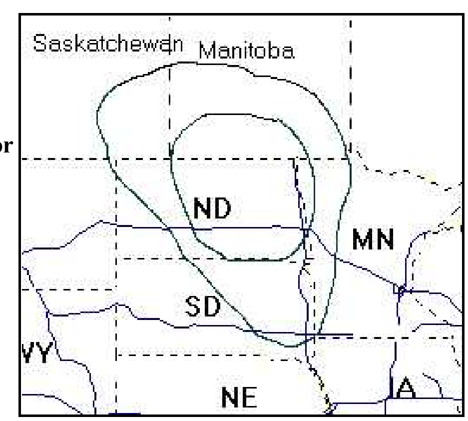
Table 4-1. Breeding and fall blackbird population sizes in the northern prairie region estimated by the National Wildlife Research Center field office in North Dakota (G. Linz, pers. comm., 2000). Area encompassed by the estimate is the prairie pothole region shown by the encircled area in Figure 1.

	Red-winged blackbird	Common grackle	Yellow-headed blackbird
Total Breeding Population	27,076,061	13,069,332	11,610,860
Fall population	39,260,288	18,950,531	16,835,747

Meanley (1971) analyzed band return data which showed that blackbirds wintering in Arkansas, Mississippi, Louisiana, and Texas came from 13, 16, 14, and 15 different states and provinces, respectively, ranging east to west from Alberta to New England and Quebec. Thus, it is probable that blackbirds wintering in Kansas come from a much broader area than just the northern prairie pothole region. This means that mortality of blackbirds at Kansas livestock feeding facilities would not just be focused on the northern prairie region but would be distributed among breeding blackbird populations across about 3/4 of the northern part of the U.S. and Canada. This factor would serve to lessen the effects of BDM-induced mortality in Kansas on the breeding population in the northern prairie region. It also means population impacts, including cumulative impacts as discussed further on herein, would be distributed across a broad segment of the North American population of blackbirds and starlings.

Based on observations of WS personnel at several affected Kansas cattle feedlots, the species composition of the birds causing damage is about 70% starlings and 25% red-winged with the remaining 5% comprised

Figure 4-2. Northern prairie region area for which blackbird population estimates are available. Estimates are for the encircled area.



of common grackles, brown-headed cowbirds, great-tailed grackles, and Brewer's blackbirds. It is estimated that under alternatives 1 and 3, WS would provide lethal control services to up to 6 facilities and kill up to 4 million birds annually. Thus, the numbers of blackbirds killed by species would be about 1 million red-winged and about 50,000 each of the other species listed above. For purposes of being conservative, population impacts analysis assumes up to about 100,000 each of the other species would be killed each year.

Red-winged blackbird population impacts. The U.S. population of red-winged blackbirds has been estimated at nearly 190 million for the U.S., based on winter roost surveys (Meanley and Royall 1976). Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1994). The number of red-winged blackbirds killed by WS BDM activities in Kansas would be about 0.5% of the U.S. wintering population. If all red-wings killed originated from the northern prairie region, then the kill would be less than 4% of the breeding population and less than 3% of the fall population in that region. That level of take would account for no more than about 1% of the estimated natural mortality of the U.S. population, and no more than 4-5% of the estimated natural mortality of the population originating from the northern prairie region if all birds killed were from that population.

Cumulative impacts on red-winged blackbirds would be as follows: up to 1 million killed in Kansas under the proposed action or alternative 1, up to about 2 million killed in North Dakota (G. Linz, NWRC, APHIS-WS, pers. comm. 2000), up to about 3.2 million in Louisiana (A. Wilson, APHIS-WS, pers. comm. 2000), and up to about 1.5 million in Texas (G. McEwen, APHIS-WS, pers. comm., 2000). Thus, the extent of total estimated mortality by all known BDM activities that could potentially affect the northern prairie population is about 7.7 million, or up to at most 20% of the fall population and about 28% of the breeding population, if all birds killed came from that population. Since it is most likely that the birds killed in Kansas, Louisiana, and Texas originate from a much broader area than the northern prairie region (Meanley 1971), the actual cumulative percentage of the northern prairie red-wing population killed would be much smaller. In a "worst-case" scenario, if all 7.7 million red-wings killed were from the northern prairie population, then cumulative take would amount to about 30-40% of the natural mortality for that population It is most likely, however, that WS take would not be focused solely in the northern prairie population, but would be distributed over about 3/4 of the North American breeding population (based on Meanley 1971). Cumulative take as a percentage of the North American population would only be about 4-10%.

Based on population modeling, Dolbeer (1998) showed that the effect of reducing survival of two blackbird species by 50% was only a 41% reduction in the population by the end of 3 years. For a U.S. population of 190,000,000 red-wings with an assumed average annual survival of 50%, cutting the survival in half would require the mortality of an additional 47 million per year over the natural mortality level. Assuming that human-induced mortality is mostly compensatory, instead of additive, to natural mortality, this level of cumulative impact is well within the extent of normal mortality levels and thus well within the ability of the population to withstand.

Data from Sauer et al. (2000) show the red-winged blackbird population has been stable in Kansas, slightly declining in the Central BBS region for the period 1966-1999, and slightly declining in the U.S. and survey-wide BBS areas as a whole. However, the trend for the most recent 5 years in the Central BBS region, in the U.S., and survey-wide, has been stable. (See Appendix C). CBC data for the period 1959-1988 show an increasing trend over North America. Thus, it appears that previous human-caused mortality or other factors have not resulted in major declines in the red-wing population.

Common grackle population impacts. Common grackle populations have been estimated at more than 100 million for the U.S. (Meanley and Royall 1976). Table 4-1 shows this species numbers about 13 million breeding birds and nearly 19 million fall birds in the northern prairie region. The numbers that might be taken by WS under the proposed action or alternative 1 are relatively minor (less than 100,000 in any one year), which would be only 0.1% of the nationwide population and 0.8% of the fall birds in the northern prairie region. These numbers are well within normal mortality levels for this species. Other human-induced mortality of this species that may occur annually is about 200,000 in Louisiana and 560,000 in Texas and less than 10,000 in North Dakota (G. Linz, NWRC, A. Wilson, and G. McEwen, APHIS-WS, pers. comm., 2000), which brings total anticipated cumulative take to about 900,000. This would be less than 1% of the U.S. population and, if all common grackles taken were from the northern prairie region, no more than about 5% of that population. These levels are well within normal mortality levels and thus within the ability of the overall population to withstand (further evidenced by the population modeling results of Dolbeer (1998) cited above). Also, BBS and CBC data in Appendix C shows that common grackle populations in the Central BBS region and in the U.S. as a whole have been relatively stable from 1966-1999. Thus, the population appears to have held its numbers in recent years and is doing well.

<u>Brown-headed cowbird population impacts</u>. Brown-headed cowbirds have been estimated at more than 90 million nationwide (Meanley and Royall 1976). Under the proposed action and alternative 1, is estimated that up to 100,000 might be taken by WS in Kansas. Other human-induced mortality that may occur annually is about 400,000 in Louisiana, 840,000 in Texas, and less than 10,000 in North Dakota (G. Linz, NWRC, A. Wilson, and G. McEwen, APHIS-WS, pers. comm., 2000), which would bring total expected cumulative take to less than 1.3 million. This cumulative take would be less than 1.5% of the total U.S. population, which is well within the ability of the overall population to withstand. BBS and CBC data in Appendix C depict relatively stable population trends for this species.

<u>Other blackbird species</u>. Other species that might be taken in small numbers include Brewer's blackbirds and great-tailed grackles. Meanley and Royall (1976) estimated the Brewer's blackbird population at about 10 million, and the great-tailed grackle population at about 600,000. BBS data in Appendix C show that Brewer's blackbirds have been declining somewhat over the U.S. as a whole, but increasing in the Central BBS region (Sauer et al. 2000). CBC data indicate a relatively stable population (Sauer 1996). The great-tailed grackle populations appear to be increasing over the U.S., the Central BBS region, and Kansas (Sauer et al. 2000). The numbers of these species observed at Kansas feedlots have been exceedingly minor in relation to the other species analyzed above, and take should be insignificant to these overall populations.

WS has not observed any yellow-headed blackbirds at Kansas feedlots during winter when lethal BDM activities would be conducted. Table 4-1 shows that the northern prairie region has an estimated 11.6 million breeding birds and 16.8 million fall birds of this species. Appendix C shows conflicting trend information – BBS data show an increasing trend for the Central BBS region and the U.S. as a whole, but CBC data show a decreasing trend in the wintering population. Nevertheless, lethal BDM activities at Kansas feedlots are not expected to affect this species. If any small numbers of yellow-heads show up during use of lethal chemical toxicant bait methods, such mortality should have no major impact on the overall population.

<u>Feral Domestic Pigeon Population Impacts</u>

The feral domestic pigeon, also known as the rock dove, is an introduced nonnative species in North America. Breeding Bird Survey data indicate the species has been stable across the western United States from 1966 through 1999 (Sauer et al. 2000). The species is not protected by federal or state law. Although regional population impacts would be minor, even if significant regional or nationwide reductions could be achieved, this would not generally be considered an adverse impact on the human environment because the species is not part of native ecosystems. However, major population reduction in some localities may be considered a negative impact by some individuals who experience aesthetic enjoyment of pigeons. It is unlikely, however, that the pigeons occurring at a livestock feeding facility would be the same ones viewed by persons frequenting city parks or other urban areas where pigeon feeding or viewing is common. WS expects requests to conduct pigeon control at livestock feeding facilities to be infrequent

<u>House Sparrow Population Impacts</u>

House sparrows or English sparrows were introduced to North America from England in 1850 and have spread throughout the continent (Fitzwater 1994). The species is not protected by Federal or State laws. Like starlings and pigeons, because of their negative impacts and competition with native bird species, house sparrows are considered by many wildlife biologists, ornithologists, and naturalists to be an undesirable component of North American native ecosystems. House sparrows are found in nearly every habitat except dense forest, alpine, and desert environments. It prefers human-altered habitats, and is abundant on farms and in cities and suburbs (Robbins et al. 1983).

Breeding Bird Survey (BBS) population trends from 1966-99 indicate that house sparrows are declining in KS and throughout the U.S. as a whole (Sauer et al. 2000). Because they are considered extremely abundant and are not afforded protection by Federal or State law, depredation permits are not required before they can be killed by the public.

WS does not expect to receive many, if any, requests to conduct BDM for house sparrows at livestock feeding facilities. Such activities are included within the scope of the this in the event that a request is received. As stated previously, because house sparrows are not native to North America, a reduction in house sparrow populations could be considered a beneficial impact on populations of native bird species. Therefore, reduction of house sparrow populations in North America should not be considered as having any significant adverse impact on the quality of the human environment.

4.1.1.2 Alternative 2 - Technical Assistance Only by WS

Under this alternative, WS would have no impact on feral domestic pigeons, blackbird, starling, or other target species populations in the State because the program would not conduct any operational BDM activities but would be limited to providing advice only. Operators would likely elect to use or hire applicators to use Avitrol or Starlicide to try to achieve local population reduction. Impacts on target species populations could therefore be about the same as those of the proposed action. Thus, for the same reasons shown in the population impacts analysis in section 4.1.1.1, it is unlikely that starlings or other target bird populations would be impacted significantly if this alternative was implemented. Because facility managers or state agencies could conduct or hire BDM using Avitrol or Starlicide (containing DRC-1339), impacts on target species populations would probably be similar to those expected to occur through WS use of DRC-1339 under Alternatives 1 and 3. Because WS has no authority over actions taken by facility managers or others, impacts on target species populations may actually be similar under all alternatives.

4.1.1.3 Alternative 3 - BDM by WS at Livestock Feeding Facilities Using an Integrated Wildlife Damage Management Approach (The Proposed Action as Described in Chapter 1)

Under this alternative, WS would take up to the same numbers of target species that would be taken under Alternative 1. Thus, impacts on target species would be about the same as Alternative 1. For the same reasons shown in the population impacts analysis in section 4.1.1.1, it is unlikely that starlings or other target bird populations would be impacted significantly by implementation of this alternative.

4.1.1.4 Alternative 4 - Nonlethal BDM Only by WS

Under this alternative, WS would not use methods that would kill target bird species at livestock feeding facilities in the State and would thus have no impact on populations of those species. Because some facility operators have previously tried nonlethal methods without adequate success, it is likely they would not request assistance from WS if the only methods available for use by WS are nonlethal methods. Operators would likely elect to hire commercial applicators to use Avitrol to try to achieve local population reduction. Impacts on target species populations could therefore be about the same as those of the proposed action. Impacts on target species populations could therefore be about the same as those of the proposed action. Private efforts to reduce or prevent bird damage and perceived disease transmission risks could increase which could result in similar, but probably lesser, impacts on target species populations than the proposed action alternative. For the same reasons shown in the population impacts analysis in section 4.1.1.1, however, it is unlikely that starlings or other target bird populations would be impacted significantly by implementation of this alternative. Because facility managers or state agencies could conduct or hire BDM using Avitrol or Starlicide (containing DRC-1339), impacts on target species populations would probably be similar to those expected to occur through WS use of DRC-1339 under Alternatives 1 and 3. Because WS has no authority over actions taken by facility managers or others, impacts on target species populations may actually be similar under all alternatives.

4.1.1.5 Alternative 5 - No Federal WS BDM at Livestock Feeding Facilities (The "No Action" Alternative)

Under this alternative, WS would have no impact on target species populations at livestock feeding facilities in the State. Operators would likely elect to hire commercial applicators to use Avitrol to try to achieve local population reduction. Private efforts to reduce or prevent depredations could increase which could result in impacts on target species populations to an unknown degree. Impacts on target species under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by private persons. For the same reasons shown in the population impacts analysis in section 4.1.1.1 it is unlikely that starlings or other target bird populations would be impacted significantly by implementation of this alternative. Because facility managers or state agencies could conduct or hire BDM using Avitrol or Starlicide (containing DRC-1339), impacts on target species populations would probably be similar to those expected to occur through WS use of DRC-1339 under Alternatives 1 and 3. Because WS has no authority over actions taken by facility managers or others, impacts on target species populations may actually be similar under all alternatives.

4.1.2 Effects on nontarget species populations, including threatened and endangered species.

4.1.2.1 Alternative 1 - Lethal control by WS at livestock feeding facilities using DRC-1339 only.

Adverse Impacts on Nontarget (non-T&E) Species. WS take of nontarget species during BDM activities is extremely low to nonexistent. Although it is possible that some nontarget birds would be unknowingly killed by use of DRC-1339 for pigeon or blackbird/starling control, the method of application is designed to minimize or eliminate that risk. For example, DRC-1339 treated bait is only applied after a period of prebaiting with untreated bait material and when nontarget birds are not observed coming to feed at the site. Nontarget take by any BDM methods that might be used under the proposed action is expected to either not occur or to be exceedingly minimal. In some or many situations, nontarget species in the area that might consume chemical bait materials are most likely to be nonnative feral pigeons and house sparrows.

While every precaution is taken to safeguard against taking nontarget birds, at times changes in local flight patterns and other unanticipated events can result in the incidental take of unintended species. These occurrences are rare and should not affect the overall populations of any species under the proposed action.

Beneficial Impacts on Nontarget Species. Inter-specific nest competition has been well documented in starlings. Miller (1975) and Barnes (1991) reported starlings were responsible for a severe depletion of the eastern bluebird (*Sialis sialis*) population due to nest competition. Nest competition by starlings has also been known to adversely impact sparrow hawks (American kestrell (*Falco sparverius*) (Nickell 1967; Von Jarchow 1943; Wilmers 1987), red-bellied woodpeckers (*Centurus carolinus*), Gila woodpeckers (*Centurus uropygialis*) (Ingold 1994; Kerpez et.al. 1990), and wood ducks (*Aix sponsa*) (Shake 1967; Heusmann et.al. 1977; Grabill 1977; McGilvrey et.al 1971). Weitzel (1988) reported 9 native species of birds in Nevada had been displaced by starling nest competition, and Mason et al. (1972) reported starlings evicting bats from nest holes. Control operations as proposed in this alternative could reduce starling populations, although probably not significantly. Reduction in nest site competition would be a beneficial impact on the species listed above. Although such reductions are not likely to be significant, the benefits would probably outweigh any adverse impacts due to nontarget take.

<u>T&E Species Impacts</u>. Species that are federally listed, or are formally proposed for listing, as threatened or endangered for the State of Kansas are:

Mammals:
- Black-footed ferret (*Mustela nigripes*)
- Gray bat (*Myotis grisescens*)
- Indiana bat (*Myotis sodalis*)

Birds:
- Bald eagle (*Haliaeetus leucocephalus*)
- Eskimo curlew (*Numenius borealis*)
- Whooping crane (*Grus americana*)
- Interior least tern (*Sterna antillarum*)
- Piping plover (except Great Lakes watershed) (*Charadrius melodius*)
- Black-capped vireo (*Vireo atricapillus*)
- Mountain plover (*Charadrius montanus*) (proposed for listing)

Fish:
- Neosho madtom (*Noturus placidus*)
- Arkansas River shiner (Arkansas R. Basin) (*Notropis girardi*)
- Topeka shiner (*Notropis topeka*)
- Pallid sturgeon (*Scaphirhynchus albus*)

Plants:
- Milkweed, Mead's (*Asclepias meadii*)
- Orchid, western prairie fringed (*Platanthera praeclara*)

Also considered for possible impacts were species listed as threatened or endangered under state law and species identified as "Species in Need of Conservation." Those species are shown in Appendix D. They include 10 mammal (1 skunk, the black-footed ferret, 5 rodents, 2 bats), 25 bird, 37 fish, 12 amphibian, 14 reptile, and 31 invertebrate species.

WS use of DRC-1339 would not result in take of any of the listed species, because none have been known to occur and are not expected to occur at livestock feeding facilities. Even if any such species were to come in to such facilities, the highly controlled use of this chemical under strict label directions (i.e., prebaiting and observation to assure no nontarget species are coming to the bait sites) would avoid exposing any nontarget species to direct consumption of the bait.

The analysis in section 4.1.4 indicates there would be no adverse effects on water quality nor would eutrophication in wetland roosting areas be accelerated by the deposition of bird carcasses in such areas. Thus, any aquatic invertebrate, fish, or amphibian species would not be adversely affected by the use of DRC-1339.

The 1992 Biological Opinion (BO) from the USFWS concluded that the interior least tern and piping plover would not be adversely affected by any aspect of the WS program which included all methods of BDM described herein (USDA 1994, Appendix F).

The mountain plover is a lowland grassland bird species and is not found in the mountains, in spite of its common name (Sager 1996). The species' diet consists nearly completely of invertebrates (Klingel 1997) and does not occur at sites where WS might be requested to use toxicants for BDM at livestock feeding facilities. Therefore, WS BDM activities would have no effect on this species.

The 1992 Biological Opinion (BO) from the USFWS determined that the only BDM method that might adversely affect the bald eagle was above ground use of strychnine treated bait for "nuisance birds." Strychnine is no longer registered for above ground use and would not be used by WS for BDM in the State.

DRC-1339 poses no primary hazard to eagles or other raptors (birds of prey) because these predatory birds do not eat grain or other bait materials on which this chemical might be applied during BDM, and, further, because hawks and, in particular, eagles are highly resistant to DRC-1339 — up to 100 mg doses were force fed to captive golden eagles with no mortality or adverse effects noted other than regurgitation and head-shaking (Larsen and Dietrich 1970). Secondary hazards to raptors from DRC-1339 and Avitrol are low to nonexistent (see Appendix B). Therefore, WS BDM as proposed in this EA would have no adverse effects on bald eagles.

DRC-1339 could potentially adversely affect the Whooping Crane. However, use of this chemical for feral domestic pigeon control around or on buildings and structures and for blackbird/starling control at feedlots/dairies would not affect the whooping crane because it is not known to occur at such sites. In the 1992 BO, the USFWS concluded that toxicants used by the WS program, including use of DRC-1339 for blackbird/starling control, would not jeopardize the whooping crane and that incidental take was not anticipated.

The inherent safety features of DRC-1339 use that preclude or minimize hazards to mammals and plants are described in Appendix B and in a formal risk assessment in the WS FEIS (USDA 1994, Appendix P). Those measures and characteristics should assure there would be no jeopardy to T&E species or adverse impacts on mammalian or non-T&E bird scavengers from use of DRC-1339. None of the other control methods described in the proposed action alternative pose any hazard to nontarget or T&E species.

4.1.2.2 Alternative 2 - Technical Assistance Only

Alternative 2 would not allow any WS direct operational BDM in the area. There would be no impact on nontarget or T&E species by WS activities from this alternative. Technical assistance or self-help information would be provided at the request of producers and others. Without direct assistance from WS, however, facility managers would likely use Avitrol or Starlicide (containing DRC-1339) to kill birds.

Avitrol poses somewhat greater risk of secondary hazard to scavengers than DRC-1339 (USDA 1994, Appendix P). However, the formal risk assessment concluded "no probable risk" for that chemical as well. It is readily broken down or metabolized into removable compounds that are excreted in urine in the target species (ETOXNET 1996). Therefore, little of the chemical remains in killed birds to present a hazard to scavenging nontarget wildlife. Although Avitrol has not been specifically tested as a cancer-causing agent, the chemical was found not to be mutagenic in bacterial organisms (EPA 1997). Therefore, the best scientific information available indicates it is not a carcinogen. Regardless, the extremely controlled and limited circumstances in which Avitrol is used would prevent exposure of members of the public to this chemical. Therefore, it is unlikely that use of Avitrol by private entities would result in adverse effects on federal or state-listed species.

Use of DRC-1339 in Starlicide by facility managers or commercial applicators would present similar risks of secondary poisoning nontarget hazards as WS's use of DRC-1339 under Alternatives 1 and 3 (i.e., no significant adverse effects are probable). Primary nontarget hazards (i.e., nontarget birds consuming treated bait material) may be greater if applicators are less careful to observe for presence of nontarget species and avoid treating where they are coming to prebait sites. Increased use of Avitrol because of lack of operational service by WS could present slightly higher risk to raptors, including bald eagles; however, the risk is still believed to be low.

4.1.2.3 Alternative 3 - BDM by WS at Livestock Feeding Facilities Using an Integrated Wildlife Damage Management Approach (The Proposed Action as Described in Chapter 1)

Under this alternative, the potential for nontarget take by WS would be low, similar to Alternative 1. For the same reasons shown in the impacts analysis in section 4.1.2.1, it is unlikely that any nontarget species would be impacted significantly by implementation of this alternative. The other methods that might be used or recommended under the Integrated Wildlife Damage Management approach are either virtually 100% selective for the target species or are nonlethal measures that should have no adverse effects on nontarget species.

4.1.2.4 Alternative 4 - Nonlethal BDM Only by WS

Risks to nontarget and T&E wildlife would be about the same as described under Alternative 2.

4.1.2.5 Alternative 5 - No Federal WS Bird Damage Management

Risks to nontarget and T&E wildlife would be about the same as described under Alternatives 2 and 4.

4.1.3 Effects on Human Health and Safety

4.1.3.1 Impacts of Chemical BDM Methods on Human Health

Alternative 1 - Lethal Control by WS at Livestock Feeding Facilities Using DRC-1339 Only

DRC-1339 (3-chloro-p-toluidine hydrochloride). DRC-1339 is the only BDM method that would be used under alternative 1. In the past there has been some concern expressed by members of the public that unknown but perhaps significant risks to human health may exist from DRC-1339 used for BDM.

DRC-1339 is one of the most extensively researched and evaluated pesticides ever developed in the field of wildlife damage management.. Over 30 years of studies have demonstrated the safety and efficacy of this compound. Appendix B provides more detailed information on this chemical and its use in BDM. Factors that virtually eliminate any risk of public health problems from use of this chemical are:

- its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops.
- DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours, which means that treated bait material generally is nearly 100% broken down within a week.
- it is more than 90% metabolized in target birds within the first few hours after they

consume the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people.

- application rates are extremely low (less than 0.1 lb. of active ingredient per acre) (EPA 1995).

- a human would need to ingest the internal organs of birds found dead from DRC-1339 to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur.

- The EPA has concluded that, based on mutagenicity (the tendency to cause gene mutations in cells) studies, this chemical is not a mutagen or a carcinogen (i.e., cancer-causing agent) (EPA 1995). Regardless, the extremely controlled and limited circumstances in which DRC-1339 is used would prevent any exposure of the public to this chemical.

The above analysis indicates that human health risks from DRC-1339 use by WS or through Starlicide use by facility managers or others would be virtually nonexistent under any alternative.

Alternative 2 - Technical Assistance Only by WS

Alternative 2 would not allow any direct operational BDM assistance by WS in the State. WS would only provide advice and, in some cases, equipment or materials (i.e., by loan or sale) to other persons who would then conduct their own damage management actions. Concerns about human health risks from WS's use of chemical BDM methods would be alleviated because no such use would occur. However, DRC-1339 would probably be used anyway as Starlicide which should be available by January 2001 (M. O'Bryan, PM Resources, pers. comm. 2000). Facility managers could also employ the use of Avitrol; however, if Starlicide becomes available as expected, use of Avitrol would probably not be as prevalent. Use of Avitrol and Starlicide in accordance with label requirements should avoid any hazard to members of the public. Therefore, risks to human health from this alternative should not be significant.

Alternative 3 - BDM by WS at Livestock Feeding Facilities Using an Integrated Wildlife Damage Management Approach

<u>DRC-1339 (3-chloro-p-toluidine hydrochloride)</u>. DRC-1339 is the primary lethal chemical BDM method that would be used under alternative 3. The effects of implementing this alternative on human health and safety would therefore be the same as for Alternative 1 as described above which means there should be no significant risks of adverse effects.

<u>Other BDM Chemicals</u>. Other nonlethal BDM chemicals that might be used or recommended by WS if they become registered would include repellents such as methyl anthranilate (artificial grape flavoring used in foods and soft drinks sold for human consumption), which has been used as an area repellent for various species of birds and is currently being researched as a livestock feed additive. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or the Food and Drug Administration (FDA). Any operational use of chemical repellents would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health.

Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1994).

Alternative 4 - Nonlethal BDM Only by WS

Alternative 4 would not allow for any lethal methods use by WS in the State. WS could only implement nonlethal methods such as harassment and exclusion devices and materials. Nonlethal methods could, however, include chemical repellents such as methyl anthranilate which, although already considered safe for human consumption because it is artificial grape flavoring, might nonetheless raise concerns about human health risks. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or FDA. Any operational use of chemical repellents would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health.

Under this alternative, facility managers would probably use DRC-1339 in the form of Starlicide, if it becomes available as expected, and could also elect to employ the use of Avitrol. However, if Starlicide becomes available, use of Avitrol would probably not be as prevalent. Use of Avitrol and Starlicide in accordance with label requirements should avoid any hazard to members of the public. Therefore, risks to human health from this alternative should not be significant.

Alternative 5 - No Federal WS BDM at Livestock Feeding Facilities (No Action)

Alternative 5 would not allow any WS BDM in the State. Concerns about human health risks from WS's use of chemical BDM methods would be alleviated because no such use would occur. However, facility managers would probably use DRC-1339 in the form of Starlicide, if it becomes available as expected, and could also elect to employ the use of Avitrol. However, if Starlicide becomes available, use of Avitrol would probably not be as prevalent. Use of Avitrol and Starlicide in accordance with label requirements should avoid any hazard to members of the public. Therefore, risks to human health from this alternative should not be significant.

4.1.3.2 Impacts on Human Safety of Nonchemical BDM Methods

Alternative 1 - Lethal Control by WS at Livestock Feeding Facilities Using DRC-1339 Only

This alternative consist of chemical control only thus was not analyzed here since non-chemical tools would not be used.

Alternative 2 -Technical Assistance Only by WS

Under this alternative, WS would not engage in direct operational use of any nonchemical BDM methods. Risks to human safety from WS's use of firearms and pyrotechnics would be zero. Increased use of firearms and pyrotechnics by less experienced and trained private individuals might occur without WS direct operational assistance. However, risks to human safety would still most likely not be significant.

Alternative 3 -BDM by WS at Livestock Feeding Facilities Using an Integrated Wildlife Damage Management Approach

Nonchemical BDM methods that might raise safety concerns include shooting with firearms and harassment with pyrotechnics. Firearms are only used by WS personnel who are experienced in handling and using them. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. The KS WS program has had no accidents involving the use of firearms or pyrotechnics in which a member of the public was harmed. A formal risk assessment of WS's operational management methods (including the nonchemical methods discussed here) found that risks to human safety were low (USDA 1994, Appendix P). Therefore, no significant impacts on human safety from WS's use of these methods is expected.

Alternative 4 - Nonlethal BDM Only by WS

Alternative 4 would not allow for any lethal BDM methods use by WS at livestock feeding facilities in the State. WS could only implement nonlethal methods such as harassment and exclusion devices and materials including pyrotechnics. As stated above, WS has had no accidents with these methods involving the public and risks to human safety have been determined to be low by a formal risk assessment (USDA 1994, Appendix P). Increased use of firearms and pyrotechnics by less experienced and trained private individuals might occur without WS assistance. However, risks to human safety would still most likely not be significant.

Alternative 5 - No Federal WS Bird Damage Management

Under this alternative, WS would not engage in or recommend use of any nonchemical BDM methods. Risks to human safety from WS's use of firearms and pyrotechnics would not exist. Increased use of firearms and pyrotechnics by less experienced and trained private individuals might occur without WS assistance. However, risks to human safety would still most likely not be significant.

4.1.4 Effects on Water Quality and Wetland Ecosystems

4.1.4.1 Potential for Chemicals Used in BDM to Run off Site and Affect Aquatic Organisms

Alternative 1 - Lethal control by WS at livestock feeding facilities using DRC-1339 only

Under this alternative, WS would use DRC-1339 in accordance with EPA-approved label directions. USDA (1994, Appendix P) contains information pertinent for analyzing the potential for effects on water quality from use of this chemical and is incorporated by reference. The chemical is very soluble in water (one liter of water can dissolve 91 grams). Based on this solubility, it would appear that there would be a high potential for the material to be transported away from sites where it is used. However, DRC-1339 degrades rapidly under both aerobic and anaerobic conditions in soils with a half-life of less than two days. This degradation process is likely to diminish concentrations before the chemical migrates to groundwater or off-site surface water areas. Continued degradation would occur even if the chemical was transported off-site and would be more than 90% degraded within about one week based on a half-life of two days.

Available information suggests DRC-1339 has low potential for aquatic and invertebrate toxicity. Results from Marking and Chandler (1981) and Blasberg and Herzog (1991) cited in the WS FEIS indicate that aquatic toxicity of DRC-1339 to water fleas occurred at 1.6 mg/L. The majority of LC_{50}s[1] ranged from 6 to 18 mg/L for such species as glass shrimp, snails, crayfish, and Asiatic clams (Marking and Chandler 1981). LC_{50} values[8] for bluegill and catfish ranged from 21 to 38 mg/L (USDA 1994, Appendix P).

The greatest quantity of DRC-1339 that might be used by WS at an individual facility at any one time is expected to be 16 ounces (454 g). If all of the 16 ounces of chemical was transported off-site and made it to surface or ground water, the water supply would have to be no more than 75,000 gallons in size to present a 50% lethal hazard to water fleas, no more than 6,700 to 20,000 gallons in size to present such a hazard to other invertebrates, or no more than 3,200 to 5,700 gallons to present such a hazard to bluegills or catfish. Put in perspective, 75,000 gallons is equivalent to a pond that is about 65 feet across and averages only 3 feet deep. These water volumes are much smaller than are likely to be encountered in streams or lakes in the area, and are undoubtedly only a tiny fraction of the ground-water supply in the area. Because treated bait material is not applied unless target birds are already taking a similar quantity of untreated prebait material, it is highly unlikely that much, if any, of the chemical would be left on the ground where it could be subjected to off-site transport by rainfall. The risk is further mitigated by the fact that the chemical degrades rapidly as discussed above.

The formal risk assessment contained in the WS programmatic EIS concluded no probable risk to aquatic organisms (USDA 1994, Appendix P). This analysis further indicates that the low quantities used at any one site, rapid degradation, and dilution factors act together to virtually eliminate any potential for hazard to humans or aquatic organisms due to possible contamination of run-off or ground-water.

Alternative 2 - Technical Assistance Only by WS

Under this alternative, WS would not use DRC-1339 at livestock feeding facilities. Therefore, there would be no potential for this chemical to run off into water supplies because of WS's BDM activities. However, facility managers would likely still use DRC-1339 in the form of Starlicide or would resort to private commercial pesticide applicators using Avitrol.

The risk to water quality from use of DRC-1339 by non-WS entities should be low for the same reasons identified under Alternative 1 above.

Avitrol is available as a prepared grain bait mixture that is mixed in with clean bait at no greater than a 1:9 treated to untreated mixture of bait kernels or particles. Several factors virtually eliminate health risks to members of the public or to water quality from use of this product as an avicide:

- It is readily broken down or metabolized into removable compounds that are excreted in urine in the target species (ETOXNET 1996). Therefore, little of the chemical remains in killed birds to pose contamination risks to water supplies.

- although Avitrol has not been specifically tested as a cancer-causing agent, the chemical was found not to be mutagenic in bacterial organisms (EPA 1997) . Therefore, the best scientific information available indicates it is not a carcinogen. Regardless, however, the controlled and limited circumstances in which Avitrol is used would prevent exposure of members of the public to this chemical or contamination of water supplies.

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[8] An LC_{50} is the concentration of a chemical in water (in milligrams of chemical per liter of water) that is expected to result in death of 50 percent of the test subjects of a given species.

Alternative 3 - BDM by WS at Livestock Feeding Facilities Using an Integrated Wildlife Damage Management Approach

Under this alternative, WS could use or recommend a variety of BDM methods, including the use of DRC-1339 at livestock feeding facilities. The potential for adverse effects on water quality from use of that chemical would be the same as shown above for Alternative 1, which means virtually no potential risk. Other chemical methods that might be employed should they become available include repellents (e.g., the food additive methyl anthranilate). Chemical repellents would have to be registered by the EPA and the KDA, or the FDA if they are used as feed additives, which means they would have undergone substantial environmental review for potential impacts on water quality. Those processes should assure that chemical repellent uses would not have a significant impact on water quality.

Alternative 4 - Nonlethal BDM Only by WS

Alternative 4 would not allow for any lethal BDM methods use by WS at livestock feeding facilities in the State. WS could only implement nonlethal methods such as harassment and exclusion devices and materials including pyrotechnics. The only chemical methods that might be employed by WS would include repellents should any become registered or available. As stated under Alternative 3 above, repellents would have to be registered by the EPA and the KDA, or the FDA if they are used as feed additives, which means they would have undergone substantial environmental review for potential impacts on water quality. Those processes should assure that chemical repellent uses would not have a significant impact on water quality.

Under this alternative, facility managers would probably resort to use of Starlicide (DRC-1339) or Avitrol, but the risks to water quality should be low for the same reasons identified under Alternative 2.

Alternative 5 - No Federal WS BDM at Livestock Feeding Facilities (No Action)

Alternative 5 would not allow for any BDM assistance by WS at livestock feeding facilities in the State. Under this alternative, facility managers would probably resort to use of Starlicide (DRC-1339) or Avitrol, but the risks to water quality should be low for the same reasons identified under Alternative 2.

4.1.4.2 Potential to Accelerate Eutrophication of Wetland Areas

Alternative 1 - Lethal Control by WS at Livestock Feeding Facilities Using DRC-1339 Only

Under this alternative WS expects that up to 3 million starlings and 1 million blackbirds would be killed by use of DRC-1339 and that the majority of these would die in nighttime roost sites. Some of the primary roost sites where this would occur are in cattail marsh wetland habitat areas. Large numbers of wintering blackbirds and starlings are known to roost in some of the wetland cattail marsh habitats within the State (Zimmerman 1990).

The delayed mode of action of DRC-1339 is such that most of the birds would not become lethargic and die until they are in their nighttime roost sites. Thus, it is estimated that the carcasses of as many as 4 million blackbirds and starlings could be deposited into cattail marsh areas as a result of WS's activities in Kansas in any one year.

Blackbirds and starlings deposit large quantities of fecal material into nighttime roost sites. If no birds were killed by WS, then they would continue to roost and deposit fecal material into cattail marsh roost areas for the entire winter roosting period. Therefore, this analysis looks at a comparison between the amount of nutrients that would be deposited by bird carcasses killed in control actions and the amount of nutrients in the bird droppings those same birds would deposit if they were not killed.

Hayes and Caslick (1984) reported average weights of red-winged blackbirds of about 49 grams (56 g for males, 39 g for females). The average weight of a starling is about 87 g (Blem 1981). Three million starlings and one million red-wings killed and falling into cattail marsh roost sites would therefore weigh about 261,000 and 49,000 kg, respectively. The lean dry weight (excluding the weight of water, fat, and feathers) of starlings is about 24% of the whole weight (calculated from data in Blem 1981). A literature search produced no similar statistic for red-winged blackbirds; however, data for another passerine species (white-crowned sparrow) was found in Chilgren (1977) which indicated lean dry weight is probably about 21% of whole weight for red-winged blackbirds. Under these assumptions, the lean dry weight of the 261,000 kg of starling carcasses and 49,000 kg of red-winged carcasses would be about 73,000 kg.

Key nutrients that contribute to wetland eutrophication include carbon (C), nitrogen (N), phosphorus (P), and potassium (K) (Cole 1975). Data on the amounts of these nutrients in red-winged blackbird and starling carcasses could not be located in the literature. However, Chilgren (1985) determined that the amount of nitrogen in lean dry mass of white-crowned sparrows ranged from 12 to 14%. The dry weight of plumage in that species was found to be about 19 to 25% of lean dry mass (Chilgren 1985), and the quantity of nitrogen in the feathers of that species has been reported to be about 15% of the dry plumage weight (Murphy 1982). Assuming that these statistics are about the same for blackbirds and starlings, then the weight of nitrogen deposited in marsh areas because of birds killed by WS in Kansas would total about 13,000 kg (about 3,000 kg of this would be from the feathers).

Based on data from Hayes and Caslick (1984), the dry weight of nitrogen, phosphorus, and potassium from the nightly droppings of red-winged blackbirds averages about 67, 10.5, and 9.9 mg per bird, respectively. Starlings excrete about 1.5 times as much as red-winged blackbirds (Hayes and Caslick 1984). Estimates of the total number of blackbirds and starlings roosting at individual cattail marsh roost sites in winter have been as high as 9 to 12 million (Zimmerman 1990). The total amount of nitrogen excreted by that many birds over a 3-month wintering period would be in the range of 70,000 to 100,000 kg. Under these assumptions, if the 3 million starlings and 1 million red-winged blackbirds were not killed in BDM actions, they would deposit about 33,000 kg of nitrogen (about 27,000 kg from starlings and about 6,000 kg from red-wings) into the marsh habitat over a 3-month wintering period. This is more than 2.5 times the amount of nitrogen that would be deposited by the carcasses of the birds if they were killed by BDM actions.

This analysis indicates that implementing this alternative (or the proposed action) would most likely result in a *reduction* in the amount of at least one primary nutrient (nitrogen) in cattail marsh ecosystems used as nighttime roosts. A net reduction of about 20,000 kg of nitrogen (33,000 kg with no control vs.13,000 kg if control is conducted) would be expected as a result of bird control actions. This would be a minor overall reduction in the total amount of nutrients contributed to the marsh over the winter. If BDM actions killed the birds later in the season, then at most an additional 10,000 kg of nitrogen would be deposited into the marsh habitat via bird carcasses. This would not be a noticeable increase in the amount of nitrogen deposited by the entire roosting population during the course of the winter and would be well within the range of variability that would be expected to occur based on population fluctuations. Also, as pointed out below, nitrogen is rarely a limiting factor among the nutrients necessary to cause accelerated eutrophication, because it is generally available from the air via precipitation (Cole 1975).

Other major nutrients that contribute to plant production (and thus, potentially, eutrophication) in freshwater ecosystems are carbon, phosphorus, and potassium (Cole 1975). The amount of carbon in passerine bird carcasses has been reported to range from 42 to 50% of lean dry mass (Chilgren 1985). Assuming the statistic for blackbirds and starlings is at the upper end of this range, the maximum amount of carbon that would be deposited in cattail marsh roosting areas by bird carcasses killed by WS would be about 37,000 kg. Assuming, hypothetically, that these were distributed over only one of the known larger cattail marsh areas used by wintering blackbirds and starlings in Kansas (e.g., the 13,000 acre Cheyenne Bottoms State Wildlife Area), then, at most, this would amount to about 7 kg/ha (6.2 lb./acre) of carbon contributed to a wetland ecosystem. Primary production of vegetation in cattail marshes has been reported to range from 13,000 to 15,000 kg /ha (11,600 to 13,400 lb./acre) dry weight (Bernard and Fitz 1979). Considering the productivity of cattail marsh habitats and the large amounts of vegetative and animal biomass already present, the additional amount of carbon input from bird carcasses should not be a significant increase over the amounts already present in the system. In addition, carbon is rarely a limiting factor among nutrients available to cause eutrophication because it is generally readily available to plants in the form of carbon dioxide in the air (Cole 1975).

Phosphorus is frequently the limiting nutrient in freshwater systems (Cole 1975). Therefore, increases in phosphorus are frequently the primary cause of accelerated eutrophication. The amount of phosphorus in carcasses of starlings, blackbirds, or other passerine bird species was not found in the literature. However, Williams et al. (1978) reported that phosphorus content in the oven-dried carcasses of chicks of four species of penguins ranged from 3,000 to 22,500 ppm (parts per million). Potassium content was reported to range from 700 to 12,900 ppm. Assuming the higher end of these ranges would apply to blackbirds and starlings (to err on the side of overestimating), the 73,000 kg (dry weight) of blackbird and starling carcasses that might be killed and deposited in a cattail marsh roost site would put as much as 1,650 kg of phosphorus and 940 kg of potassium into the particular wetland ecosystem affected. On the other hand, if they were not killed, those same birds would deposit about 5,000 kg of phosphorus and 4,900 kg of potassium over a 90-day wintering period via droppings (based on Hayes and Caslick 1984). Therefore, it appears that use of DRC-1339 as proposed herein would not result in any net increase in the amount of these two nutrients in wetland ecosystems which means accelerated eutrophication would not be expected to occur as a result of BDM activities.

The amounts of phosphorus and potassium in the vegetation of cattail marshes have been estimated to average about 44 and 220 kg/ha (39 and 196 lb./acre), respectively (Bernard and Fitz 1979). As an example, one of the larger known cattail roosting areas in the State is about 13,000 acres in size (e.g., the Cheyenne Bottoms State Wildlife Area). Assuming, hypothetically, that bird carcasses killed during BDM activities were distributed over that area alone, then, at most, this would add only about 0.3 kg of phosphorus per hectare /ha (0.3 lb./acre) to the local ecosystem. The amount added by bird droppings by those same birds if they were not killed would be about 1.0 kg/ha over a 3-month wintering period. These numbers are only about 0.7% (for carcasses) and 2.3% (for droppings) of the amount of phosphorous that would normally already be in the system, which suggests that the birds affected by BDM, whether killed or not, would not contribute substantially to the phosphorus load in the marsh. As stated above, phosphorus is usually the limiting nutrient that, when increased, is a frequent cause of accelerated eutrophication. Therefore, it appears that neither killing nor protecting the blackbirds and starlings that roost in cattail marshes would significantly affect the abundance of this nutrient. This supports a conclusion that none of the BDM alternatives discussed herein would significantly alter the process of eutrophication in marsh roosting areas.

Alternative 2 - Technical Assistance Only by WS

Under Alternative 2, WS will only give advice to livestock feeding facilities. Thus water quality would have no potential to be impacted by WS's operational use of BDM methods.

Facility managers would probably elect to use Starlicide (DRC-1339), if it becomes available as expected, and/or Avitrol by commercial pest control operators. Avitrol kills target birds more rapidly than DRC-1339, and most would not make it to nighttime roosting areas before dying. It is expected that facility managers would choose to use Starlicide instead of Avitrol in most cases, in which case, the numbers of bird carcasses and associated nutrients deposited into wetland roost sites would be about the same as with DRC-1339 use by WS under Alternatives 1 and 3. This means there would be no potential for causing accelerated eutrophication under this alternative, similar to Alternatives 1 and 3.

Alternative 3 - BDM by WS at Livestock Feeding Facilities Using an Integrated Wildlife Damage Management Approach

Under this alternative, WS would use DRC-1339 at livestock feeding facilities. The potential for causing accelerated eutrophication at wetland roost sites would be the same as shown above for Alternative 1, which means little or no potential risk.

Alternative 4 - Nonlethal BDM Only by WS

Alternative 4 would not allow for any lethal BDM methods use by WS at livestock feeding facilities in the State. WS could only implement nonlethal methods such as harassment and exclusion devices and materials including pyrotechnics. Facility managers would probably elect to use Starlicide (DRC-1339), if it becomes available as expected, and/or Avitrol by commercial pest control operators. Avitrol kills target birds more rapidly than DRC-1339, and most would not make it to nighttime roosting areas before dying. It is expected that facility managers would choose to use Starlicide instead of Avitrol in most cases, in which case the numbers of bird carcasses and associated nutrients deposited into wetland roost sites would be about the same as with DRC-1339 use by WS under Alternatives 1 and 3. This means there would be no potential for causing accelerated eutrophication under this alternative.

Alternative 5 - No Federal WS BDM at Livestock Feeding Facilities (No Action)

Alternative 5 would not allow for any BDM assistance by WS at livestock feeding facilities in the State. Facility managers would probably elect to use Starlicide (DRC-1339), if it becomes available as expected, and/or Avitrol by commercial pest control operators. Avitrol kills target birds more rapidly than DRC-1339, and most would not make it to nighttime roosting areas before dying. It is expected that facility managers would choose to use Starlicide instead of Avitrol in most cases, in which case, the numbers of bird carcasses and associated nutrients deposited into wetland roost sites would be about the same as with DRC-1339 use by WS under Alternatives 1 and 3. This means there would be no potential for causing accelerated eutrophication under this alternative.

4.1.5 Effects on Aesthetic Values of Wild Bird Species

4.1.5.1 Alternative 1 - Lethal Control by WS at Livestock Feeding Facilities Using DRC-1339 Only

Under this alternative, WS would kill what some people would perceive to be a large number of blackbirds and starlings during winter at requesting livestock feeding facilities. There may be some people who enjoy seeing wintering blackbirds and starlings. If so, those people might feel their interests were being harmed. However, the population impacts analysis earlier in this chapter indicates the overall population would not be significantly affected, which means opportunities to view these species would continue to exist.

WS's experience has generally been that, whereas many people perceive some pleasure or enjoyment at seeing relatively small concentrations of blackbirds and perhaps even starlings, most people directly affected by large wintering concentrations perceive them as an annoyance or a health hazard. Reductions in wintering blackbird or starling numbers would be viewed by those people as an aesthetic improvement. It is possible that some of the blackbirds or starlings that would be killed at livestock feeding facilities would die in nighttime roost sites in trees or wooded areas near to or in urban or suburban areas. This has been known to happen with Avitrol use (J. Phillips, KWDP, pers. comm. 2000). Also, some birds might die en route to nighttime roost sites with DRC-1339 use, despite the tendency for most birds to die at their nighttime roost sites, and be visible to passers by. This would be particularly noticeable if they fall onto snow covered areas where the black bodies would contrast sharply with the white snow. If this occurs, some people might perceive these numbers of dead birds to be aesthetically displeasing. WS would plan to mitigate this effect by retrieving visible dead birds following baiting operations, or by requiring facility managers to provide personnel to pick up visible dead birds as a condition of receiving operational service by WS (this depends on receiving permission to trespass by property owners).

Some members of the public may view reductions of local wintering blackbird and starling populations as an aesthetic improvement. Concentrations of roosting birds have resulted in calls to the WS office in Kansas concerning nuisance noise, odor and fecal contamination. Some towns such as Dodge City have had active harassment programs in order to move birds from urban areas.

4.1.5.2 Alternative 2 - Technical Assistance Only by WS

Under this alternative, WS would not conduct any direct operational BDM at livestock feeding facilities but would still provide technical assistance or self-help advice to such facilities. Persons who may enjoy viewing blackbirds and starlings would not be affected by WS's activities under this alternative because the individual birds would not be killed by WS. However, facility managers would likely resort to other available means of conducting BDM including the use of Starlicide (if/when available) and/or Avitrol, which means the impacts would likely be similar to actions taken by WS under Alternatives 1 and 3. Past use of Avitrol at cattle feeding facilities has resulted in some instances in which many of the birds died en route to roosting areas. Many carcasses were visible on snow-covered ground along flight lines away from the facilities where the treatment took place, which resulted in some members of the public voicing displeasure at seeing the dead birds. This can also occur with the use of Starlicide, despite the tendency for most birds to die at nighttime roost sites. Nevertheless, the potential for this type of impact is probably greater under this alternative than under Alternatives 1 and 3.

4.1.5.3 Alternative 3 - BDM by WS at Livestock Feeding Facilities Using an Integrated Wildlife Damage Management Approach

This alternative would result in impacts on aesthetics that would be similar to Alternative 1 - i.e., some people who enjoy seeing wintering blackbirds and starlings might feel their interests were being harmed because numbers of birds would be killed. However, similar to Alternative 1, the population impacts analysis earlier in Chapter 4 indicates overall populations of these species would not be significantly affected, which means opportunities to view these species would continue to exist.

Similar to Alternative 1, it is possible that some birds killed by WS would die in nighttime roost sites in trees or wooded areas near to or in urban or suburban areas, or would fall en route to roost sites and be visible to the public, resulting in aesthetic displeasure by some people. WS would plan to mitigate this effect by picking up visible dead birds following baiting operations, or by requiring facility managers to provide personnel to pick up visible dead birds as a condition of receiving operational service by WS.

Any feral pigeon control conducted by WS at livestock feeding facilities under this alternative would not affect overall populations. Pigeon control in some localities may be considered a negative impact by some individuals who experience aesthetic enjoyment of pigeons. It is unlikely, however, that the pigeons occurring at a livestock feeding facility would be the same ones viewed by persons frequenting city parks or other urban areas where pigeon feeding or viewing is common.

As stated for Alternative 1, some members of the public may view reductions of local wintering blackbird and starling concentrations that result from BDM actions as an aesthetic improvement. Concentrations of roosting birds have resulted in calls to the WS office in Kansas concerning nuisance noise, odor and fecal contamination. Some towns such as Dodge City have had active harassment programs in order to move birds from urban areas.

4.1.5.4 Alternative 4 - Nonlethal BDM Only by WS

Under this alternative, WS would be restricted to nonlethal methods only. Some members of the public would be pleased knowing WS activities were not killing any birds at livestock feeding facilities. However, similar to Alternative 2, facility managers would likely implement other BDM methods, including the use of Avitrol which could lead to similar aesthetic concerns and impacts as described under Alternative 2 above.

4.1.5.5 Alternative 5 - No Federal WS Bird Damage Management

Alternative 5 would not allow for any BDM assistance by WS at livestock feeding facilities in the State. Some members of the public would be pleased knowing WS activities were not killing any birds at livestock feeding facilities. However, similar to Alternative 2, facility managers would likely implement other BDM methods, including the use of Avitrol which could lead to similar aesthetic concerns and impacts as described under Alternatives 2 and 4 above.

4.1.6 Humaneness of Lethal Bird Control Methods

4.1.6.1 Alternative 1 - Lethal Control by WS at Livestock Feeding Facilities Using DRC-1339 Only

Under this alternative, a chemical method of lethal control (DRC-1339) would be used that some persons would view as inhumane because the birds do not die right away. This chemical causes a quiet and apparently painless death that results from uremic poisoning and congestion of major organs (Decino et al. 1966). The birds become listless and lethargic, and a quiet death normally occurs in 24 to 72 hours following ingestion. However, the method appears to result in a less stressful death than that which probably occurs by most natural causes which are primarily disease, starvation, and predation. For these reasons, WS considers DRC-1339 use under the current program to be a relatively humane method of lethal BDM. However, despite the apparent painlessness of the effects of this chemical, some persons will view any method that takes a number of hours to cause death as inhumane and unacceptable.

4.1.6.2 Alternative 2 - Technical Assistance Only by WS

Under this alternative, WS would not conduct any lethal or nonlethal BDM, but would provide self-help advice only to livestock feeding facilities. Thus, lethal methods viewed as inhumane by some persons would not be used by WS.

Without WS direct operational assistance, it is expected that some facility managers would reject nonlethal recommendations or would not be willing to pay the extra cost of implementing and maintaining them and would seek alternative lethal means which would most likely include the use of Starlicide (DRC-1339) and/or Avitrol. Avitrol causes distress symptoms in treated birds with the intended effect of frightening the other untreated birds away from the location of the damage. Some people would view this as less humane than DRC-1339, even though the Avitrol-treated birds would die more quickly. WS expects facility managers would elect to use Starlicide over Avitrol, in which case, concerns about humaneness would be similar to WS's use of DRC-1339.

Another lethal method that would likely be used more by non-WS entities would be shooting which would also be viewed by some persons as inhumane. In general, however, shooting results in a quick death of the targeted birds.

If illegal toxicants were used, they would probably result in a more rapid death than DRC-1339, but would probably cause more distress in the treated birds.

Overall, BDM under this alternative would likely be somewhat less humane than Alternatives 1 and 3.

4.1.6.3 Alternative 3 - BDM by WS at Livestock Feeding Facilities Using an Integrated Wildlife Damage Management Approach

Under this alternative, methods viewed by some persons as inhumane would continue to be used in BDM by WS. These methods would include use of DRC-1339 (similar to Alternative 1) by WS in combination with other methods that may be appropriate on a case-by-case basis, such as harassment and facility modification.

The primary lethal chemical BDM method that would be used by WS under this alternative would be DRC-1339. Concerns and impacts about the issue of humaneness would be similar to those described above under Alternative 1.

4.1.6.4 Alternative 4 - Nonlethal BDM Only by WS

Under this alternative, lethal methods viewed as inhumane by some persons would not be used by WS. Similar to Alternative 2, without WS direct operational assistance, it is expected that some facility managers would reject nonlethal recommendations or would not be willing to pay the extra cost of implementing and maintaining them and would seek alternative lethal means which would most likely include the use of Starlicide and/or Avitrol, or increased use of shooting.

Overall, it is likely that effects on the issue of humaneness would be similar to Alternative 2.

4.1.6.5 Alternative 5 — No Federal WS Bird Damage Management

Under this alternative, lethal methods viewed as inhumane by some persons would not be used by WS. Similar to Alternatives 2 and 4, without WS direct operational assistance, it is expected that some facility managers would reject nonlethal recommendations or would not be willing to pay the extra cost of implementing and maintaining them and would seek alternative lethal means which would most likely include the use of Starlicide and/or Avitrol, or increased use of shooting.

Overall, it is likely that effects on the issue of humaneness would be similar to Alternatives 2 and 4.

4.2 Summary of WS Impacts

Table 4-2 presents a relative comparison of the anticipated impacts of each of the alternatives as they relate to each of the major issues considered in detail in Chapter 2. A major summary conclusion of this analysis is that, because Starlicide will likely become available for facility managers to use in the near future, DRC-1339 will probably be used under virtually all alternatives, although not necessarily by WS. Thus, the relative impacts on each of the environmental issues analyzed would be similar for most of the alternatives. None of the alternatives analyzed would be expected to result in any significant adverse environmental effect.

Table 4-2 Relative comparison of anticipated impacts among alternatives

	Alt. 1 Lethal control using DRC-1339 only	*Alt. 2 Technical assistance only*	*Alt. 3 Integrated Wildlife Damage Management approach **(Proposed Action)***	*Alt. 4 Nonlethal Only*	*Alt. 5 No federal BDM*
Effects on target species populations	Blackbird and starling populations reduced by WS but not significantly	Blackbird and starling populations probably still reduced by private entities but not significantly	Blackbird and starling populations reduced by WS but not significantly	Blackbird and starling populations probably still reduced by private entities but not significantly	Blackbird and starling populations probably still reduced by private entities but not significantly
Effects on nontarget species populations	Nontarget species not significantly affected	Nontarget species possibly affected to a greater degree, but not significantly	Nontarget species not significantly affected	Nontarget species possibly affected to a greater degree, but not significantly	Nontarget species possibly affected to a greater degree, but not significantly
Effects on T&E and SINC Species	T&E species not adversely affected	Slightly greater potential for adverse effects on bald eagles, although still unlikely. Other T&E species not adversely affected	T&E species not adversely affected	Slightly greater potential for adverse effects on bald eagles, although still unlikely. Other T&E species not adversely affected	Slightly greater potential for adverse effects on bald eagles, although still unlikely. Other T&E species not adversely affected
Effects on human health and safety	No probable adverse effect	No probable adverse effect	No probable adverse effect	No probable adverse effect	No probable adverse effect
Effects of chemical use on water quality	No probable adverse effect	No probable adverse effect	No probable adverse effect	No probable adverse effect	No probable adverse effect
Potential to accelerate eutrophication in wetland roosting areas	Accelerated eutrophication unlikely, natural eutrophication process likely to be slowed down	Accelerated eutrophication unlikely, natural eutrophication process likely to be slowed down	Accelerated eutrophication unlikely, natural eutrophication process likely to be slowed down	Accelerated eutrophication unlikely, natural eutrophication process likely to be slowed down	Accelerated eutrophication unlikely, natural eutrophication process likely to be slowed down

Table 4-2 Relative comparison of anticipated impacts among alternatives

	Alt. 1 Lethal control using DRC-1339 only	*Alt. 2 Technical assistance only*	*Alt. 3 Integrated Wildlife Damage Management approach **(Proposed Action)***	*Alt. 4 Nonlethal Only*	*Alt. 5 No federal BDM*
Effects on aesthetic values of wild bird species	Effect should be minor; affected bird species will continue to be available for aesthetic enjoyment; some people would consider local reductions as aesthetic improvement	Effect should be minor; affected bird species will continue to be available for aesthetic enjoyment; some people would consider local reductions as aesthetic improvement	Effect should be minor; affected bird species will continue to be available for aesthetic enjoyment; some people would consider local reductions as aesthetic improvement	Effect should be minor; affected bird species will continue to be available for aesthetic enjoyment; some people would consider local reductions as aesthetic improvement	Effect should be minor; affected bird species will continue to be available for aesthetic enjoyment; some people would consider local reductions as aesthetic improvement
Humaneness of lethal bird control methods	Should be perceived as relatively humane (DRC-1339 results in lethargy, apparent peaceful death of target birds)	Probably perceived as somewhat less humane due to greater private use of Avitrol, shooting, and other lethal methods	Should be perceived as relatively humane (DRC-1339 results in lethargy, apparent peaceful death of target birds)	Probably perceived as somewhat less humane due to greater private use of Avitrol, shooting, and other lethal methods	Probably perceived as somewhat less humane due to greater private use of Avitrol, shooting, and other lethal methods

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Predecision

APPENDIX A

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Predecision

APPENDIX B

**BIRD DAMAGE MANAGEMENT (BDM) METHODS
AVAILABLE FOR USE OR RECOMMENDATION
BY THE KANSAS WILDLIFE SERVICES PROGRAM**

NONLETHAL METHODS - NONCHEMICAL

Agricultural producer and property owner practices. These consist primarily of nonlethal preventive methods such as cultural methods and habitat modification. Cultural methods and other management techniques are implemented by the agricultural producer or property owners/managers. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgement on their effectiveness and practicality. These methods include:

Cultural methods. At feedlots or dairies, cultural methods generally involve modifications to the level of care or attention given to livestock which may vary depending on the age and size of the livestock. Animal husbandry practices include but are not limited to techniques such as night feeding, indoor feeding, closed barns or corrals, removal of spilled grain or standing water, and use of bird proof feeders (Johnson and Glahn 1994). Increased feed size may reduce consumption by starlings but may not be cost effective for the producer (Twedt and Glahn 1984).

Environmental/Habitat modification can be an integral part of BDM. Wildlife production and/or presence is directly related to the type, quality, and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain bird species or to repel certain birds. In most cases, the resource or property owner is responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management can be used to minimize damage caused by blackbirds and starlings that form large roosts during late autumn and winter if landowners have management control over such roost areas. Bird activity can be greatly reduced at roost sites by removing all the trees or selectively thinning the stand. Roosts often will re-form at traditional sites, and substantial habitat alteration is sometimes the only way to permanently stop such activity at a site (USDA 1994). In many cases, the birds are traveling many miles from roost sites to feeding areas, and relocating roosts may not reduce problems at livestock feeding facilities if the new roost locations are still within commuting distance for the birds.

Animal behavior modification. This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve use of scare tactics or fencing to deter or repel animals that cause loss or damage (Twedt and Glahn 1982). Some but not all methods that are included by this category are:

- Bird-proof barriers
- Propane exploders
- Pyrotechnics
- Distress Calls and sound producing devices
- Chemical frightening agents
- Repellents
- Scare crows
- Mylar tape
- Eye-spot balloons

These techniques are generally only practical for small areas. Scaring devices such as distress calls, helium filled eye spot balloons, raptor effigies and silhouettes, mirrors, and moving disks can be effective but usually for only a short time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Graves and Andelt 1987, Mott 1985, Shirota et al. 1983, Conover 1982, Arhart 1972). Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, Tobin et al. 1988).

Bird proof barriers can be effective but are often cost-prohibitive, particularly because of the aerial mobility of birds which requires overhead barriers as well as peripheral fencing or netting. Exclusion adequate to stop bird movements can also restrict movements of livestock, people, and other wildlife (Fuller-Perrine and Tobin 1993). Heavy plastic strips hung vertically in open doorways have been successful in some situations in excluding birds from buildings used for indoor feeding or housing of livestock (Johnson and Glahn 1994). Plastic strips, however, can prevent or substantially hinder the filling of feed troughs or feed platforms at livestock feeding facilities. Such strips can also be covered up when the feed is poured into the trough by the feed truck. They are not practical for open-air feedlot operations that are not housed in buildings. However, dairy industry representatives from Kansas recently toured some European dairies that use clear plastic strips to exclude birds from free stall barns and report the method is cost-effective (C. Lee, KSU-CES, pers. comm., 2000).

Auditory scaring devices such as propane exploders, pyrotechnics, electronic guards, scare crows, and audio distress/predator vocalizations are effective in many situations for dispersing damage-causing bird species. These devices are sometimes effective but usually only for a short period of time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Mott 1985, Shirota et.al. 1983, and Arhart 1972). Williams (1983) reported an approximate 75% reduction in feed loss by blackbirds at a south Texas feedlots as a result of pyrotechnics and propane cannon use. Johnson and Glahn (1994) advised that scaring methods are less effective in cold winter months in areas where snow covers natural food sources. They stated a primary concern is that scaring may disperse birds to other livestock facilities. This could compound costs of control over multiple facilities and may raise concerns about disease transfer. These methods are sometimes considered not practical in dairy or feedlot situations because of the disturbance to livestock, although livestock can generally be expected to habituate to the noise. Birds, too, quickly learn to ignore scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Visual scaring techniques such as use of mylar tape (highly reflective surface produces flashes of light that startles birds), eye-spot balloons (the large eyes supposedly give birds a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing bird damage. Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et.al. 1986, and Tobin et.al. 1988). Birds quickly learn to ignore visual and other scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Relocation of damaging birds to other areas following live capture generally would not be effective nor cost-effective. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and relocation would most likely result in bird damage problems at the new location. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

Live traps include:

Clover, funnel, and common pigeon traps are enclosure traps made of nylon netting or hardware cloth and come in many different sizes and designs, depending on the species of birds being captured. The entrance of the traps also vary greatly from swinging-door, one-way door, funnel entrance, to tip-top sliding doors. Traps are baited with grains or other food material which attract the target birds. WS' standard procedure when conducting pigeon trapping operations is to ensure that an adequate supply of food and water is in the trap to sustain captured birds for several days. Active traps are checked as appropriate, to replenish bait and water and to remove captured birds.

Decoy traps are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by Johnson and Glahn (1994) and McCracken (1972). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds which enter and become trapped themselves. Active decoy traps are monitored as appropriate, to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.

Nest box traps may be used by WS for corrective damage management and are effective in capturing local breeding and post breeding starlings and other targeted secondary cavity nesting birds (DeHaven and Guarino 1969, Knittle and Guarino 1976). Trapped birds are euthanized. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and relocation would most likely result in bird damage problems at the new location. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

Mist nets are more commonly used for capturing small-sized birds such as house sparrows, finches, etc. but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. It was introduced in to the United States in the 1950's from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines which birds can be caught and overlapping "pockets" in the net cause birds to entangle themselves when they fly into the net.

Cannon nets are normally used for larger birds such as pigeons, feral ducks, and waterfowl and use mortar projectiles to propel a net up and over birds which have been baited to a particular site. This type of net is especially effective for waterfowl that are flightless due to molting and other birds which are typically shy to other types of capture.

NONLETHAL METHODS - CHEMICAL

Particulate feed additives have been investigated for their bird-repellent characteristics. In pen trials, starlings rejected grain to which charcoal particles were adhered (L. Clark, National Wildlife Research Center, pers. comm. 1999). If further research finds this method to be effective and economical in field application, it might become available as a bird repellent on livestock feed. Charcoal feed additives have been explored for use in reducing methane production in livestock and should have no adverse effects on livestock, on meat or milk production, or on human consumers of meat or dairy products (L. Clark, NWRC, pers. comm. 1999). Some proposed repellent methods such as charcoal and limestone particle feed additives may not require EPA and KDA registration (C. Lee, KSU-CES, pers. comm., 2000).

Other chemical repellents. A number of other chemicals have shown bird repellent capabilities. Anthraquinone, a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism, has shown effectiveness in protecting rice seed from red-winged blackbirds and grackles (Avery et al. 1997). It has also shown effectiveness as a foraging repellent against Canada goose grazing on turf and as a seed repellent against brown-headed cowbirds (Dolbeer et al. 1998). This chemical is currently not registered for use at livestock feeding facilities but may become available for such use in the future. Compounds extracted from common spices used in cooking and applied to perches in cage tests have shown repellent characteristics against roosting starlings (Clark 1997). Naphthalene (moth balls) was found to be ineffective in repelling starlings (Dolbeer et al. 1988).

Methyl anthranilate (MA) (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species, including waterfowl (Dolbeer et al. 1993). MA may some day become available for use as a livestock feed additive (Mason et.al. 1984; 1989). It is registered for applications to turf or to surface water areas used by unwanted birds. The material has been shown to be nontoxic to bees (LD_{50} > 25 micrograms/bee[9]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[10]), and of relatively low toxicity to fish and other invertebrates. Methyl anthranilate is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient (Dolbeer et al. 1992; RJ Advantage, Inc. 1997). It has been listed as "Generally Recognized as Safe" (GRAS) by the U.S. Food and Drug Administration (Dolbeer et al. 1992).

Tactile repellents. A number of tactile repellent products are on the market which reportedly deter birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that the birds avoid. However, experimental data in support of this claim are sparse (Mason and Clark 1992). The repellancy of tractile products is generally short-lived because of dust, and they sometimes cause aesthetic problems and expensive clean-up costs by running down the sides of buildings in hot weather. These methods are not expected to be of use in alleviating blackbird and starling problems at livestock facilities.

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Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. Avitrol, however, is not completely nonlethal in that a small portion of the birds are generally killed (Johnson and Glahn 1994). Prebaiting is usually necessary to achieve effective bait acceptance by the target species. This chemical is registered for use on pigeons, crows, gulls, blackbirds, starlings, and English sparrows in various situations. Avitrol treated bait is placed in an area where the targeted birds are feeding and usually a few birds will consume a treated bait and become affected by the chemical. The affected birds then broadcast distress vocalizations and display abnormal flying behavior, thereby frightening the remaining flock away.

Avitrol is a restricted use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. It can be used during anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies demonstrated that Avitrol is strongly adsorbed onto soil colloids and has moderately low mobility, so it would not tend to migrate toward the water table. Biodegradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its availability for intake by organisms from water, is nonaccumulative in tissues and rapidly metabolized by many species (Schafer 1991).

Avitrol is acutely toxic to avian and mammalian species. However, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning, and during field use only magpies and crows appear to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to two to 3.2 times the published Lethal Dose (LD_{50}) in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. A formal Risk Assessment found no probable risk is expected for pets and the public, based on low concentrations and low hazards quotient value for nontarget indicator species tested on this compound (USDA 1994, Appendix P).

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove nuisance waterfowl and feral pigeons. It is labor intensive and, in some cases, may not be cost effective (Wright 1973, Feare et al. 1981), but is typically used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as a well contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds.

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[9]An LD_{50} is the dosage in milligrams of material per kilogram of body weight, or, in this case in micrograms per individual bee, required to cause death in 50% of a test population of a species.

[10]An LC_{50} is the dosage in milligrams of material per liter of air required to cause death in 50% of a test population of a species through inhalation.

WS personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha-chloralose was eliminated from more detailed analysis in USDA (1994) based on critical element screening, therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bioaccumulation in plants and animal tissue is believed to be low. Alpha-chloralose is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990) but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, nontarget species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

LETHAL METHODS - MECHANICAL

Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large number of birds are present. Normally shooting is conducted with shotguns or air rifles. Shooting is a very individual specific method and is normally used to remove a single offending bird. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce nonlethal methods. Shooting can be relatively expensive because of the staff hours sometimes required (USDA 1994). It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with shotguns, air rifles, or rim and center fire rifles is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. All firearm safety precautions and laws and regulations governing the lawful use of firearms are followed by WS when conducting BDM activities.

WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (administered by the EPA and the Kansas Department of Agriculture (KDA)) or by the FDA. WS personnel that use restricted-use chemical methods are certified as pesticide applicators by KDA and are required to adhere to all certification requirements set forth in FIFRA and Kansas pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

CO_2 is sometimes used to euthanize birds which are captured in live traps and when relocation is not a feasible option. Live birds are placed in a container such as a plastic 5-gallon bucket or other type of chamber which is then sealed shut. CO_2 gas is released into the bucket or chamber and birds are quickly rendered unconscious and then die after inhaling the gas. This method is approved as a euthanizing agent by the American Veterinary Medical Association. CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

DRC-1339 is a chemical that, for more than 30 years, has proven to be an effective method of starling, blackbird, and pigeon control in a variety of situations (West et al. 1967, Besser et al. 1967, Decino et al. 1966). Several studies and reports have documented the effectiveness of DRC-1339 in resolving blackbird starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987). Blanton et al. (1992) reported that DRC-1339 appears to be a very effective, selective, and safe means of pigeon population reduction.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species but only slightly toxic to nonsensitive birds, predatory birds, and mammals. For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors, sparrows, and eagles are classified as nonsensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to nontarget and T&E species (USDA 1994). Secondary poisoning has not been observed with DRC-1339 treated baits. During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent. DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 1994). Appendix P of USDA (1994) contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion. That assessment concluded that no adverse effects are expected from use of DRC-1339.

Predecision

APPENDIX D
SPECIES LISTED AS THREATENED, ENDANGERED, AND AS "SPECIES IN NEED OF CONSERVATION (SINC) IN THE STATE OF KANSAS

State Threatened:
- Mammals:
  - Eastern spotted skunk (*Spilgale putorius interrupta*)
- Birds:
  - Bald eagle (*Haliaeetus leucocephalus*)
  - Piping plover (except Great Lakes watershed) (*Charadrius melodius*)
  - Snowy plover (*charadrius alexandrinus*)
  - White-faced ibis (*Plegedis chihi*)
- Fish:
  - Arkansas darter (*Etheostoma cragini*)
  - Blackside darter (*Percina maculata*)
  - Chestnut lamprey (*Ichthyomyzon castaneus*)
  - Flathead chub (*Platygobio graacilis*)
  - Hornyhead chub (*Nocomis biguttatus*)
  - Neosho madtom (*Noturus placidus*)
  - Redspot chub (*Nocomis asper*)
  - Silverband shiner (*Notropis shumardi*)
  - Sturgeon chub (M*acrhybopsis gelida*)
  - Topeka shiner (*Notropis topeka*)
  - Western silvery minnow (*Hybognathus argyritis*)
- Invertebrates:
  - Butterfly mussel (*Elipsaria lineolata)*
  - Flutedshell mussel (*Lasmigona costata*)
  - Ouachita kidneyshell mussel (*Ptychobranchus occidentalis)*
  - Rock pocketbook mussel (*Arcidens confragosus*)
  - Sharp hornsnail (*Pleurocera acute*)
- Amphibians:
  - Dark-sided salamander (*Eurycea longicauda melanopleura*)
  - Eastern narrowmouth toad (*Gastrophryne carolinensis*)
  - Eastern newt (*Notophthalmus viridescens louisianensis)*
  - Green frog (*Rana clamitans melanota*)
  - Strecker's chorus frog (*Psuedacris streckeri streckeri*)
  - Northern spring peeper (*Pseudacris crucifer crucifer*)
  - Western green toad (*Bufo debilis insidior*)
- Reptiles:
  - Broadhead skink (*Eurneces laticeps*)
  - Checkered garter snake (*Thamnophis marcianus marcianus*)
  - Common map Turtle (*Graptemys geopgraphica*)
  - New Mexico blind snake (*leptotyphiops dulcis dissectus*)
  - Northern redbelly snake (*Storeria occipitomaculata occipitomaculata*)
  - Smooth earth snake (*Virginia valeriae elegans*)
  - Texas longnose snake (*Rhinocheilus lecontei tessellatus*)
  - Texas night snake (*Hypsigiena torquata jani*)

State endangered:

Mammals:

- Black-footed ferret (*Mustela nigripes*)
- Gray bat (*Myotis grisescens*)

Birds:

- Black-capped vireo (*Vireo atricapillus*)
- Eskimo curlew (*Numenius borealis*)
- Least tern (*Sterna antillarum*
- Peregrine falcon (*Falco peregrinus*)
- Whooping crane (*Grus americana*)

Fish:

- Arkansas river shiner (*Notropis girardi*)
- Pallid sturgeon (*Scaphirhynchus elbus*)
- Sicklefin Chub (*Macrhybopsis meeki*)
- Speckled chub (*Macrhybopsis eestivalis tetranemus*)

Amphibians:

- Cave salamander (*Eurycea lucifuga*)
- Graybelly salamander (*Eurycea multiplicata griseogaster*)
- Grotto salamander (*Typhlotriton spelaeus*)

Invertebrates:

- American byrying beetle (*Nicrophorus americanus*)
- Ellipse mussel (*Venustaconcha ellipsiformis*)
- Elktoe mussel (*Alasmidonta marginata*)
- Flat floater mussel (*Anodonta suborbiculata*)
- Mucket mussel (*Actinonaias ligamentina*)
- Neosho mucket mussel (*Lampsilis rafinesqueana*)
- Rabbitsfoot mussel (*Quadrula cylindrica cylindrica*)
- Scott riffle beetle (*Optioservus phaeus*)
- Slender walker snail (*Pomatiopsis lepidaria*)
- Western fanshell mussel (*Cyprogenia aberti*)

State listed “Species in Need of Conservation”(SINC):

Mammals:

- Eastern chipmunk (*Tamia striatus*)
- Franklin’s ground squirrel (*Spermophilus franklinii*)
- Pallid bat (*Antrozous pallidus bunkeri*)
- Southern bog lemming (*Synaptomys cooperi*)
- Southern flying squirrel (*Glaucomys volans volans*)
- Texas mouse (*Peromyscus attwateri*)
- Townsend’s big-eared bat (*Plecotus townsendii pallescens*)

Birds:

- Black rail (*Laterallus jamaicensis*)
- Black tern (*Chlidonias niger*)
- Bobolink (*Dolichonyx oryzivorus*)
- Cerulean warbler (*Dendroica cerulea*)
- Chihuahuan raven (*Corvus cryptoleucus*)
- Curve-billed thrasher (*Toxostoma curvirostre*)
- Ferruginous hawk (*Buteo regalis*)
- Golden eagle (*Aquila chrysaetos*)
- Henslow’s sparrow (*Ammodramus henslowii*)
- Ladder-backed woodpecker (*Picoides scalaris*)

Long-billed curlew (*Numenius americanus*)
Mountain plover (*Charadrius montanus*)
Red-shouldered hawk (*Buteo lineatus*)
Short-eared owl (*Asio flammeus*)
Whip-poor-will (*Caprimulgus vociferus*)
Yellow-throated warbler (*Dendroica dominica*)

Fish:
Banded darter (*Etheostoma zonale*)
Banded sculpin (*Cottus carolinae*)
Black redhorse (*Moxostoma duquesnei*)
Blacknose dace (*Rhinichthys atratulus*)
Blue sucker (*Cycleptus elongatus*)
Bluntnose darter (*Etheostoma chlorosomum*)
Brassy minnow (*Hybognathus hankinsoni*)
Gravel chub (*Erimystax x-punctatus*)
Greenside darter (*Etheostoma biennioides*)
Highfin carpsucker (*Carpiodes velifer*)
Northern hog sucker (*Hypentelium nigricans*)
Ozark minnow (*Notropis nubilus*)
Plains minnow (*Hybognathus placitus*)
River darter (*Percina shumardi*)
River redhorse (*Moxostoma carinatum*)
River shiner (*Notropis biennius*)
Slough darter (*Etheostoma gracile*)
Speckled darter (*Etheostoma stigmaeum*)
Spotfin shiner (*Cyprinella spiloptera*)
Spotted sucker (*Minytrema melanops*)
Stippled darter (*Etheostoma punctulatum*)
Tadpole madtom (*Noturus gyrinus*)

Amphibians:
Northern crawfish frog (*Rana areolata circulosa*)
Red-spotted toad (*Bufo punctatus*)

Reptiles:
Alligator snapping turtle (*Macroclemys temminckii*)
Eastern hognose snake (*Heterodon platirhinos*)
Glossy snake (*Arizona elegans*)
Rough earth snake (*Virginia striatula*)
Timber rattlesnake (*Crotalus horridus*)
Western hognose snake (*Heterodon nasicus*)

Invertebrates:
Cylindrical papershell mussell (*Anadontoides ferussacianus*)
Deertoe mussel (*Truncilla truncata*)
Fat mucket mussel (*Lampsilis radiata luteola*)
Fawnsfoot mussel (*Truncilia donaciformis*)
Gray petaltail dragonfly (*Tachopteryx thoreyi*)
Neosho midget crayfish (*Orconectes macrus*)
Ozark emerald dragonfly (*Somatochlora ozarkensis*)
Prairie mole cricket (*Gryllotalpa major*)
Round pigtoe mussel (*Pleuroberna coccineum*)
Snuffbox mussel (*Epioblasma triquetra*)
Spike mussel (*Elliptio dilatata*)

Squawfoot mussel (*Strophitus undulatus*)
Wabash pigtoe mussel (*Fusconaia flava*)
Wartyback mussel (*Quadrula nodulata*)
Washboard mussel (*Megalonaias nervosa*)
Yellow sandshell mussel (*Lampsilis teres*)